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October 1989

BULL MOUNTAINS EXCHANGE
Draft EIS

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

BLM-MT-ES-90-001-4120

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
MONTANA STATE OFFICE
222 NORTH 32ND STREET
P.O. BOX 36800
BILLINGS, MONTANA 59107-6800

TAKE PRIDE IN AMERICA

IN REPLY TO:

[redacted]

Dear Reader:

This draft Environmental Impact Statement (EIS) on the Bull Mountains Exchange is presented for your review and comment. This document analyzes the proposed action, i.e., the exchange of selected Federal coal lands to Meridian Minerals Company for high-value recreational and wildlife offered lands. The proposed action is BLM's preferred alternative. Two coal-for-coal exchange alternatives, a leasing alternative and a no-action alternative are also addressed.

We welcome your comments on the contents of this EIS. We are particularly interested in comments on the following: (1) possible errors in the analysis, (2) new information that would influence our analysis, and (3) areas that need clarification. Specific comments will be most helpful.

We would appreciate your comments on the EIS by January 5, 1990. Questions or comments should be directed to Bill Matthews, Project Manager, Bureau of Land Management, Miles City District Office, P.O. Box 940, Miles City, Montana 59301, telephone (406) 232-7000.

Public meetings have been scheduled to allow individuals the opportunity to comment on the draft EIS. The meetings will be held at the following locations:

Date	*Location*	*Time*
November 27, 1989	Central School Multipurpose Room Sixth Avenue and Second Street Roundup, Montana	7 p.m. MDT
November 28, 1989	Eastern Montana College Ball Room 1500 North 30th Street Billings, Montana	7 p.m. MDT
December 4, 1989	Bureau of Land Management Butte District Office 106 North Parkmont Bute, Montana	7 p.m. MDT

All written and oral comments received during the 60-day comment period will be given equal consideration in the preparation of the final EIS scheduled for completion in May 1990.

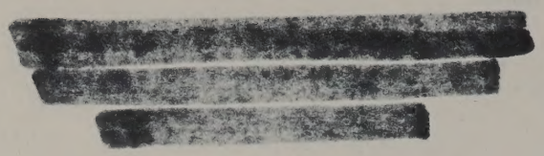
Please keep this copy of the draft EIS as portions of it may not be reprinted in the final. Copies of the final EIS will be sent to all those individuals who provide comments on the draft EIS or request a copy.

Thank you for your comments and assistance on this project. By working together, it helps us prepare the best possible EIS to determine the public's interest on this proposed exchange.

Sincerely,

Marvin LeNoue

Marvin LeNoue
State Director



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BULL MOUNTAINS EXCHANGE;

DRAFT EIS

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Marvin LeMove

State Director
U.S. Bureau of Land Management

Department of State Lands
Land Administration Division
Cooperating Agency

ENVIRONMENTAL IMPACT STATEMENT

Draft (X) Final ( )

LEAD AGENCY: Department of the Interior
Bureau of Land Management
Miles City District Office
Miles City, Montana

COOPERATING AGENCY: Department of State Lands
Land Administration Division
State of Montana
Helena, Montana

TYPE OF ACTION: Administrative

JURISDICTION: Miles City and Butte Districts

ABSTRACT: The Bull Mountains Exchange Draft Environmental Impact Statement (EIS) addresses the proposed exchange of selected Federal coal lands to Meridian Minerals Company for high-value recreation and wildlife offered lands in Montana. The proposed exchange is BLM's preferred alternative. Two coal-for-coal exchange alternatives, a leasing alternative and a no-action alternative are also addressed. The development of the coal as a small room and pillar underground mine producing 0.5 million tons of coal per year is analyzed as the most likely development scenario. A 3.0 million tons of coal per year longwall underground mine is analyzed as the maximum development scenario. A generic railroad to haul the coal is also addressed under the maximum development scenario.

COMMENT PERIOD: This is a draft Environmental Impact Statement open to public review and comment for 60 days following publication of the Notice of Availability. Public meetings will be held in Roundup, Billings and Butte, Montana, on November 27, 28 and December 4. For further information regarding this Environmental Impact Statement, contact Mat Millenbach, District Manager, Bureau of Land Management, West of Miles City, P.O. Box 940, Miles City, Montana 59301, Telephone (406) 232-4331.

Public comments should be addressed to:

Bill Matthews, EIS Project Manager
Bureau of Land Management
P.O. Box 940
Miles City, Montana 59301

SUMMARY

The Bull Mountains Exchange Environmental Impact Statement (EIS) addresses the proposed exchange of 3674.36 acres of Federal coal for 9008.49 acres of high value recreation and wildlife lands offered by Meridian Minerals Company. The proposed action is BLM's Preferred Alternative. Two coal-for-coal alternatives, a leasing alternative and a no-action alternative, are also addressed.

Development impacts of the coal as a small room and pillar underground mine producing 0.5 million tons of coal per year is analyzed as the most likely development scenario. A 3.0 million tons of coal per year longwall underground mine is analyzed as the maximum development scenario. A generic railroad to haul the coal is also addressed under this scenario.

PROPOSED ACTION-COAL FOR LAND EXCHANGE — PREFERRED (ALTERNATIVE A)

The proposed action (Alternative A) is to exchange 3,674.36 acres of BLM administered Federal coal for private high-value recreation and wildlife lands offered by Meridian Minerals. Surface ownership of the coal lands would be unaffected by the exchange proposal.

The in-place Federal coal reserves included in the exchange application total 54.5 million tons. Depending upon the mining technique used, 43.6 million tons of coal are recoverable by a long-wall mining operation and 27.3 million tons of coal are recoverable by a room-and-pillar mining operation. The value of the Federal coal under consideration for exchange has been determined to have a fair market value of $730,000. This value was determined by the BLM's Northwest Regional Evaluation Team.

In return for the Federal coal under consideration for exchange, BLM selected lands from the Meridian offered lands. Only the top six priority acquisition lands are discussed, since the preliminary value estimate for the Federal coal was less than the total appraised value of the top six priority acquisition lands.

The top six priority acquisition lands have a minimum value BLM would accept in an exchange for the Federal coal. A brief discussion and description of the top six priority acquisition lands follows.

Priority Lands Nos.1,2,3 — These three parcels of land are located in Madison County and total 697.45 acres. All three parcels are riverfront properties along the Madison River. Primary anticipated use by the public would be fishing and dispersed recreation, such as sight-seeing and picnics.

Priority Lands No.4 — This 640 acre parcel of land is located in Custer County and adjoins a large block of public land. These lands are prime mule deer habitat and receive extensive big game hunting use by the public during hunting season.

Priority Lands No.5 — These three parcels of land in Beaverhead and Deer Lodge Counties total 1475.48 acres. The lands border the Big Hole River. The lands are critical elk and mule deer habitat. Primary anticipated use by the public would be fishing and big game hunting.

Priority Lands No.6 — These thirteen parcels of land are located in Carbon County and total 6,195.56 acres. These lands contain endangered plant species habitat and mule deer habitat. Primary anticipated use by the public would be big game hunting.

MIRROR IMAGE COAL-FOR-COAL EXCHANGE (ALTERNATIVE B)

Under the mirror image coal for coal exchange (Alternative B), the Federal and Meridian coal in the project area would be split into two logical mining units of approximately equal size and value. Meridian would get one unit, BLM would get the other unit.

About 32.7 million tons of in-place Federal coal in the southern half of the project area would be exchanged for 30.5 million tons of in-place Meridian owned coal in the northern half of the project area. This alternative would provide a block of private coal of 70.8 million tons in the south half and a block of Federal coal of 60.2 million tons in the north half.

The south tract would have sufficient recoverable reserves to sustain a mine for 22 years assuming a longwall operation at 3.0 million tons annually and five years to reach full production. The north tract would sustain a similar mining operation for 19 years. With the addition of State Section 16 in the northern half there would be sufficient recoverable reserves for 23 years.

For a room and pillar mine operating at 0.5 million tons per year, and five years to reach full production, there would be sufficient recoverable reserves for 69 years in the south tract and 52 years for the north tract. Mine life could be expanded an additional 18 years if State Section 16 was included in the north tract.

If a larger mining operation began in the south tract, it is likely that the operation would eventually lease the Federal coal in the north tract.

PEABODY COAL FOR COAL EXCHANGE (ALTERNATIVE C)

Alternative C considers the option of exchanging the Federal coal in the Bull Mountains for Meridian coal in mining permit Area B of the Big Sky Mine south of Colstrip, Montana. The Federal coal lands would be exchanged for the Meridian offered coal lands. The offered Meridian coal is part of the Rosebud coal seam which averages 23.88 feet in thickness in this area. The Meridian offered parcels fall within the Area B mine plan and contain about 575 acres underlain by an estimated 21.2 million tons of recoverable coal located in T.1N., R.40E., Section 25, Lots 2,3,4, SW¼,W½SE¼ and T.1N.,R.41E., Section 19, E½E½, NW¼SE¼ and Section 31, Lots 1,2,3, E½,E½W½. Surface ownership of these offered coal lands would be unaffected and would remain as it exists now.

Under this proposal, selected Federal coal in the Bull Mountains and Meridian offered coal in the Peabody Big Sky Mine Area B would be appraised and exchanged on an equal cash value basis. An appraisal of the Meridian offered coal in mining permit Area B is being prepared and will be available for the final EIS. Mining of the BLM acquired coal could begin as early as the year 2000 and continue through 2012. Mining schedules and plans for the Meridian acquired coal in the Bull Mountains would be the same as described in the proposed action.

The amount of coal that BLM could acquire through this alternative depends on the appraised value of the Meridian offered coal. Since the appraisal is pending, a possible range of the amount of coal that BLM might acquire was developed. For analysis purposes in this draft, the impact assessment of all of the Meridian offered lands will be analyzed as the upper limit. The lower limit was set at seven million tons and would come from Section 25. F.O.B. sale price of the coal at the Big Sky Mine between March 1988 and March 1989 averaged $9.98 per ton.

LEASING (ALTERNATIVE D)

The Federal coal being considered for exchange could be leased competitively (Alternative D). Leasing could occur through a regional coal lease sale within the regional activity planning process *or*, if the Coal Production Region is decertified or partially decertified, through the lease by application process.

Regional Activity Planning

About 56.9 million tons of in-place Federal coal could be offered for lease in this alternative if a new round of activity planning was authorized and assuming a 3 million ton per year production rate. It is anticipated that a lesser amount of Federal coal would be offered for lease at a lower production rate of mining. Regional activity planning requires up to three years to complete after the Secretary of the Interior authorizes a new round of activity planning.

Lease-By-Application

If the Powder River Coal Production Region is decertified, BLM could lease the Federal coal by the lease-by-application process. Processing an application usually takes a year or longer. For analytical purposes, it is assumed that the in-place 56.9 million tons of Federal coal reserves would be offered for lease.

Emergency Leasing

An emergency lease application is the other type of coal lease which can be accepted in a Federal Coal Production Region. Processing an emergency lease application usually takes a year or longer. Leases issued as a result of an emergency lease application are limited to eight years of recoverable reserves and some portion of the leased coal must be mined within three years.

State Coal Status

As part of Meridian's efforts to secure long-term coal reserves in the Bull Mountains, they submitted three coal lease applications to the Montana Department of State Lands (DSL) for the State-owned lands.

DSL then requested that BLM consider evaluating the State lands in the EIS, if possible. T.6N., R.27E., Section 16 was relatively easy to address and is included in the EIS under the leasing alternative. T.6N.,R.26E., Section 36 has no currently marketable coal and was wanted by the mining company for surface facilities. T.7N.,R.26E., Section 36 has recoverable coal reserves but this section of land is several miles outside the geographic area this EIS addresses.

Other Federal Coal

Under the leasing alternative, BLM included 197.59 acres of Federal mineral estate which contains 148 acres of recoverable coal reserves in T.6N., R.26E., Section 24 for discussion and analysis. These lands contain an estimated 2.4 million tons of in-place coal.

Current coal market conditions indicate that the Bull Mountains coal would not become economically feasible for development until market conditions approached a $20.00 to $30.00 minimum selling price (1990 dollars). This probably would not occur until 20 to 40 years in the future. Based on these assumptions, royalty stream flows were calculated using a $25 F.O.B. mine sale price starting in 2020 (mid-range). Using these figures, a 0.5 million tons of coal per year underground mine would generate $13,367,592 in royalty payments over a forty year period. The discounted royalty payment value is $176,941 under this scenario (1990 dollars).

A 3.0 million tons of coal per year underground mine would generate $76,622,000 in royalty payments over the forty year period with a discounted value of $1,008,208 (1990 dollars).

If BLM were able to lease the Federal coal immediately and it was developed, a 0.5 million tons of coal per year underground mine would generate $7,985,628 in royalty payments over the forty year period with a discounted value of $1,676,763 (1990 dollars). A 3.0 million tons of coal per year underground mine generates $45,773,000 in royalty payments over the same forty year period with a discounted value of $9,554,192 (1990 dollars).

NO ACTION (ALTERNATIVE E)

The No Action (Alternative E) would continue present management as it exists now for all the lands. It is in essence a two-part no action alternative, i.e., denial of the exchange(s) and denial of the leasing. There would be no development of the Federal coal under this alternative.

Should BLM deny the exchanges, the Bull Mountains Federal coal lands included in the exchange application would remain in public ownership and would not be developed in the foreseeable future. The offered recreational properties would remain in private ownership as would the private coal.

Should BLM deny leasing in the Bull Mountains, the Federal coal lands would still remain in public ownership for development by future generations. There would be no immediate coal development unless it was done on private coal lands.

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CHAPTER 1

PURPOSE AND NEED

Introduction

On May 3, 1988, Meridian Minerals Company (Meridian), a wholly-owned subsidiary of Burlington Resources, submitted a land exchange proposal for consideration by the Bureau of Land Management (BLM). Meridian proposed the exchange to acquire 3,674.36 acres of Federally owned coal in the Bull Mountains area, south of Roundup, MT (Map 1). The present coal ownership is distributed in a checkerboard pattern of alternating sections between Meridian Minerals and Federal minerals administered by BLM. The proposed exchange would consolidate an underground coal tract for future development by Meridian or a lessee coal company. Surface ownership of the coal lands would be unaffected by the exchange proposal.

Yellowstone Coal Company (YCC), a mining company whose principals operate small independent mining operations in Eastern Kentucky and Southern West Virginia, approached Meridian and requested that it seek an exchange. The present checkerboard coal ownership pattern effectively isolates individual sections of coal from each other and limits the capability of large-scale mining to take place without some cooperation from Meridian and BLM. An exchange would block coal reserves and create a tract of sufficient size to justify its development.

Also, a major factor in the negotiations between a coal supplier and a potential customer is the adequacy of long-term coal reserves that the mining company controls. If the Federal coal was exchanged and/or leased to Meridian, they in turn, could lease the acquired coal to YCC.

Meridian would convey lands with high recreation, wildlife and watershed values, in trade for the Federal coal. Meridian and its Burlington Resources affiliates, Plum Creek Timber Company and Glacier Park Company, made lands available for possible acquisition in eleven counties throughout the state (Maps 2 to 5). Most of these lands were identified by BLM as high priority lands for acquisition purposes. Map 12 gives a general location of the top six priority lands being considered within the state.

As part of their effort to market the Bull Mountains coal, Meridian has applied to the State of Montana for a test burn permit for 100,000 to 250,000 tons of coal. The actual amount of coal to be mined for the test burn will vary depending upon their customer commitments. Since the test burn coal is privately owned and would be mined from either the PM Coal Company Mine in T.6N.,R.26E., Section 13 or from private coal in T.6 N.,R.26 E., Section 25, BLM is not involved in the permitting process. However, the results of the coal test burn will influence the marketability and subsequent development of the Bull Mountains coal.

Land Use Plan Conformance

All BLM resource management actions must conform with existing approved land use plans (United States Department of the Interior, Bureau of Land Management, 1987a. 43CFR 1610.5-3). Because of the widespread distribution of the lands in the exchange proposal, BLM land use plans for both the Miles City District and the Butte District are involved and their conformance is discussed accordingly.

MILES CITY DISTRICT PLANS

All the subject coal lands proposed for exchange are within the Billings Resource Area and their management is addressed in the Billings Resource Management Plan (RMP). Lands proposed for acquisition in the Miles City District are located in two resource areas, Billings and Big Dry. The plans and policy documents addressing management of public lands in these areas are as follows:

Billings Resource Management Plan
New Prairie Management Framework Plan
Supplement to State Director Guidance for Resource Management Planning in Montana and the Dakotas for Land Pattern Review and Land Adjustment

A discussion of each of these documents and their affect on the lands proposed for acquisition follows.

Billings Resource Management Plan

The Billings RMP and associated Record of Decision were completed in September 1984. The RMP states that "Federal coal exchanges will be considered on a case-by-case basis" and that "all the Federal coal which is mineable by underground methods is suitable for further consideration for leasing or exchange pending further study" (United States Department of the Interior, Bureau of Land Management, 1984a. Billings RMP). Based on these decisions, it was determined that BLM's consideration of the proposed exchange is in conformance with the Billings RMP.

The RMP also eliminates considerable acreage from surface coal mining and "specifically seeks to encourage underground mining at the expense of other mining methods in the Bull Mountains" (United States Department of the Interior, Bureau of Land Management, 1984a. Billings RMP). Large scale surface mining of Federal coal in the Bull Mountains was specifically discouraged. As a result of these decisions, only underground mining would be allowed if the subject coal lands were exchanged. An agreement prohibiting surface coal mining was made with Meridian as part of the exchange proposal and the associated Memorandum of Agreement and would be handled with an appropriate provision in the patent prohibiting surface coal mining or through a separate agreement. This arrangement satisfies the underlying intent of the decision to encourage underground mining in the Bull Mountains and would be in conformance with the RMP.

The RMP also requires a site-specific analysis prior to all land actions involving sale, exchange or acquisition. "This analysis is handled in subsequent activity planning through the Environmental Assessment/Land Report" (United States Department of the Interior, Bureau of Land Management, 1984a. Billings RMP). This report, in this case an Environmental Impact Statement, (EIS), examines and evaluates the effect of the proposed action on all affected resource values and "must show that the proposed action accrues significant benefit to the public. The same showing is required in a minerals exchange" (United States Department of the Interior, Bureau of Lands Management, 1984a. Billings RMP). In other words, before an exchange of lands can take place, it must be shown that it is in the public's interest to do so. This EIS documents the required site-specific analysis which will lead to the public interest determination and to the ultimate decision on the proposed exchange.

The same RMP decision and process applies to the lands proposed for acquisition by BLM in Carbon County (priority land acquisition No.6). The RMP identified public land retention and disposal zones and stated that "lands to be acquired by exchange would generally be located within retention zones." The proposed acquisition lands are located in the retention zones.

New Prairie Management Framework Plan (MFP)

Priority land acquisition No.4 (Custer County lands) is addressed in the New Prairie MFP which was approved September 1982. Specifically, it states that BLM would "attempt to consolidate public lands and/or minerals through exchange" and the aggregation of these public resources should be the first priority within the planning unit (United States Department of the Interior, Bureau of Land Management, 1982. New Prairie MFP). Acquisition of this parcel would increase the size of a large block of public land and would be in conformance with the New Prairie MFP and the objectives for land adjustment.

Supplement to State Director Guidance for Resource Management Planning in Montana and the Dakotas for Land Pattern Review and Land Adjustment

This supplement was published in 1984 to provide guidance for all major types of land adjustment. To assist in categorizing the public lands and in making decisions concerning specific land adjustment actions, three types of criteria were established: retention, disposal and acquisition. Through the application of these criteria, retention and disposal zones were identified for Montana. Retention zones predominantly contain public lands that meet the retention criteria and define areas where BLM intends to retain existing public lands and to acquire additional lands. All of the offered tracts in this exchange, prioritized and non-prioritized, meet the acquisition criteria as defined in the supplemental guidance and/or are within retention zones.

BUTTE DISTRICT PLANS

All lands proposed for acquisition in the Butte District are addressed in various land use planning documents. These include resource area land use plans, the Supplement to State Director's Guidance for Resource Management Planning, river management plans and a river corridor study. These various land use planning documents are as follows:

Dillon Resource Area Management Framework Plan
Upper and Lower Big Hole River Management Plans
Supplement to State Director Guidance for Resource Management Planning in Montana and the Dakotas for Land Pattern Review and Land Adjustment
Madison River Corridor Study

A discussion of each of the documents and their affect on the lands proposed for acquisition is given below.

Dillon Resource Area Management Framework Plan

This MFP, which was completed in September 1979, prescribed land adjustments in the Dillon Resource Area to increase opportunities for public use of public resources and to improve the management of those resources. The Dillon MFP specifically identified the Madison River tracts (Priority land acquisition Nos.1,2,3) for acquisition in section L-9.1.

Acquisition of the Upper Big Hole River tracts (priority land acquisition No.5) and other non-prioritized tracts within the Dillon Resource Area would be in conformance with general MFP guidance which states that lands are to be acquired or disposed of in the resource area to meet management objectives. These management objectives are to be determined in specific activity plans or through similar analyses. Two such activity plans, the Upper and Lower Big Hole River Management Plans, have since been completed. Also, the Supplement to State Director Guidance for Resource Management Planning for Land Pattern Review and Land Adjustment was subsequently completed.

Upper and Lower Big Hole River Management Plans

These plans were completed in 1985 and 1987, respectively, to address the problems and opportunities associated with the heavy recreational use of the Big Hole River. These plans recommend the retention of Federal lands which are within a one-mile corridor on each side of the Big Hole River and acquisition of lands through exchange as opportunities arise to provide for increased recreational opportunities.

As the recreational use of the river continues to increase, as is projected, public access sites on the river will become more crowded and congested. The acquisition of these lands will help alleviate these types of problems in managing future recreational use of the river.

Supplement to State Director Guidance for Resource Management Planning in Montana and the Dakotas for Land Pattern Review and Land Adjustment

This supplement was published in 1984 to provide guidance for all major types of land adjustment. Three types of criteria were established (retention, disposal and acquisition) to provide guidance in categorizing the public lands and in making decisions concerning specific land adjustment actions. Through the application of these criteria, retention and disposal zones were identified for Montana. Retention zones predominantly contain public lands that meet the retention criteria and define areas where BLM intends to retain existing public lands and to acquire additional lands. All of the tracts in this exchange, prioritized and non-prioritized, meet the acquisition criteria as defined in the supplemental guidance and/or are within retention zones.

Madison River Corridor Study

This was a joint project by Madison County, the Montana Department of Fish, Wildlife and Parks, the Bureau of Land Management and the U.S. Forest Service. The study was completed in 1983 and recommended that BLM pursue land exchanges to acquire lands with Madison River frontage. The long-term purpose of such a land exchange program would be to limit the rapid development occurring in the Madison River corridor, a one mile wide corridor on either side of the river established for planning purposes, and also to enhance the recreational opportunities that exist in conjunction with the Madison River. As recreational use of the river increases, more opportunity for access and use of the river must be made available.

Scoping Issues/Concerns

In May 1988, BLM started public scoping for an environmental impact statement on the proposal to exchange Federal coal lands in the Bull Mountains area for other lands with high public values. This proposal by Meridian Minerals Company was also the subject of public meetings in Roundup and Ennis, Montana. A scoping brochure was distributed to all interested parties, soliciting their point of view on the proposal and the EIS. Specific comments were sought on what the EIS should examine, the relative importance of the different issues, and how or why the public interest may or may not be served.

During the scoping process, BLM received oral comments from 36 people and written responses from 26 individuals and groups. Many others attended the open house and public meetings, but did not comment for the record. A total of 432 comments were recorded. Appendix 1 gives a summary of public comments and concerns.

Based on public comments, BLM decided to look at a number of different alternatives and ways of analyzing Meridian's original proposal. Two possible coal development scenarios associated with the proposed exchange and/or lease have been identified for full analysis. A low level of development (represented by the current Yellowstone Coal Company proposal) which calls for 0.5 million tons per year of production from a room and pillar mining operation is analyzed and is considered most likely. A high level of development would involve a longwall mine and a target production level of around 3.0 million tons per year, is also analyzed. This high level of production is analyzed as the maximum possible impact level.

The leasing developmental configuration is slightly different from the exchange developmental configuration primarily because the leasing configuration includes one section of State coal T.6N.,R.26E., Section 16, a portion of the Federal coal in T.6N.,R.27E., Section 24 (197.59 acres) and additional private coal in portions of several sections of land that are not included in the exchange proposal.

Most of the issues raised by the public in scoping are addressed in the EIS. Some issues, such as whether or not the exchange would have an adverse impact on competitiveness or would tend to create a monopolistic situation are not within the analytical scope of this document. These issues are germane to the public interest determination of this exchange proposal and so all public comment on these and other issues will be provided to the United States Attorney General as part of the required anti-trust review at the conclusion of the public comment period on the Draft EIS.

It should be noted that the EIS assesses the impacts of the proposed exchange and alternatives and the subsequent development of the coal lands. Although the impacts of reasonably forseeable coal development are analyzed, they are not addressed in detail at this stage of the process. If a coal mine were to be developed, these impacts would be assessed in greater detail during the permitting process required by the State of Montana and the Office of Surface Mining. If the coal lands were exchanged and/or leased, Meridian or YCC would be required to submit a mine and reclamation plan to the Montana Department of State Lands, Reclamation Division. The mine and reclamation plan would discuss all resources and impacts. Montana Department of State Lands would then complete the required environmental analysis and documentation for the project which summarizes all resources, impacts and mitigation measures necessary for approval.

Likewise, an indepth analysis of building and operating a railroad is not fully assessed in this EIS. If a railroad were to be built, Meridian and/or YCC would be required to apply for a permit from the Interstate Commerce Commission. An environmental analysis and EIS would be required before the railroad could be built. Consequently, this analysis focuses on some of the more apparent or generic impacts that would be expected if a railroad was built.

Decision Factors/Process

EIS PROCESS

"All internally or externally proposed actions on or affecting public lands or resources under BLM jurisdiction must be reviewed for NEPA [National Environmental Policy Act] compliance. The first step in the NEPA process is to screen the proposed action in order to determine the appropriate response

for ensuring NEPA compliance" (United States Department of the Interior, Bureau of Land Management, 1988a. National Environmental Policy Act Handbook). In this case, BLM made a determination that an Environmental Impact Statement would be required to make a decision on the proposed exchange. All significant environmental and socio-economic impacts, both beneficial and adverse, are analyzed to enable BLM to make the best possible decision on the proposed exchange.

There are six basic steps in the EIS process: (1) scoping the EIS; (2) conducting the analysis and preparing the draft EIS; (3) issuing the draft EIS; (4) analyzing the comments and preparing the final EIS; (5) issuing the final EIS; and (6) reaching and recording the decision. In addition to the EIS, there are other factors that are considered and play a major role in determining the decision on the proposed Bull Mountains Exchange.

ECONOMIC EVALUATION AND APPRAISALS

One of the first steps in this proposed exchange was to determine fair market values for the offered private lands and the selected Federal coal lands. The Bull Mountains proposed exchange, like all exchanges, must be an equal value for equal value exchange, based on a cash value. Appraisals and economic evaluations were completed for the offered private lands that BLM would acquire and for the selected Federal coal lands that Meridian would acquire as part of the exchange proposal.

The offered private lands were appraised by the BLM Montana State Office appraisal staff, using a comparable sales approach to determine the values. BLM would acquire the surface and all mineral rights to the offered private lands, except oil and gas rights. The land values for the priority offered private lands are shown in Table 1.1. Only the top six priority offered private lands were appraised. Additional offered private lands will be appraised and selected if more land is needed to equalize the value of the coal lands.

The value of the Federal coal lands selected by Meridian was determined by BLM's Northwest Regional Evaluation Team (NRET), located in Cheyenne, Wyoming. Coal, geologic and mine engineering data supplied by BLM's Montana State Office (Branch of Solid Minerals) plus information from Meridian and YCC were used to determine an economic value for the coal. Meridian would acquire a patent for only the coal rights. Surface and all other mineral rights will be retained in their present ownership.

TABLE 1.1

LAND VALUES OF PRIORITY OFFERED PRIVATE LANDS

Priority	*Tracts/County*	*Township*	*Range*	*Section*	*Aliquot Part*	*Acres*	*Appraised Value*	*Cost/Acre*
1	Madison	8S	1W	15	Part West of River	572.00	$471,900	$825.00
2				25	N½NE¼ East of River	48.00	$161,000	$3,354.17
3		9S	1W	1	Lots 6,7, SW¼NE¼	77.45	$245,700	$3,172.37
					Total	697.45	$878,600	
4	Custer	9N	51E	35	All	640.00	$19,200	$30.00
5	Beaverhead/ Deer Lodge	1N	13W	9	NW¼NW¼, SW¼	200.00		
				17	All	640.00		
				19	All (Frac.)	635.48		
					Total	1,475.48	$117,000	$80.00
6	Carbon	9S	21E	1	All (Frac.)	197.06		
				3	Lots 2 to 4, S½N½, S½	600.63		
				5	Lots 1 to 4, S½N½, N½S½, S½SE¼	560.44		
				7	All (Frac.)	624.08		
				9	NE,N½NW¼,S½SW¼	320.00		
				11	All	640.00		
				13	Lots 3,4	80.83		
				15	N½,W½SW¼,E½SE¼, SW¼SE¼	520.00		
				17	All	640.00		
				19	All (Frac.)	626.16		
				21	All	640.00		
				23	All	640.00		
				31	All (Frac.)	106.36		
					Total	6,195.56	$124,000	$20.01
					TOTAL VALUE OF OFFERED LANDS		$1,138,800	

CONSULTATION WITH THE ATTORNEY GENERAL

When considering a fee exchange of Federal coal deposits, the Bureau of Land Management must consult with and give due consideration to the views and advice of the Attorney General of the United States in accordance with the regulations in 43 CFR 2203. The determination as to whether the public interest is served by the exchange will include the Attorney General's advice concerning whether the exchange will create or maintain a situation inconsistent with the Federal anti-trust laws.

The proponent for a fee exchange of Federal coal deposits is required to disclose the nature and extent of its coal holdings in a certain geographic area as well as a description of the reserves which would be added or eliminated by the proposed exchange on forms prescribed by the Department of Justice. This confidential data is handled under the Freedom of Information Act and forwarded to the Attorney General.

As part of the EIS process, the public is afforded an opportunity to comment on the impacts of the proposed exchange on competition in the coal industry, on competitive coal leasing, and on whether the public interest will be served by the exchange. Copies of all written comments and transcripts of oral comments received in response to the request for public comment (provided for in 43 CFR 2203.1) will be furnished to the Department of Justice.

Following publication of the Draft EIS and at the conclusion of the public comment period on the Draft, copies of all public comments on the proposed exchange will also be sent to the Attorney General. If there is a change in the information submitted to the Department of Justice pertaining to the proponent's coal reserves, the proponent of the exchange is required to furnish a statement of any and all changes in holdings since the date of the previous submission.

At this time, pursuant to 43 CFR 2203.4, the Attorney General will have 90 days to review and analyze all of the information provided. The Attorney General may request additional time and/or information. The 90-day period will be extended for the period required to obtain the additional information or for the period requested by the Attorney General. Within 90 days or longer if an extension is warranted, the Attorney General may advise, in writing, on the anti-trust consequences of the proposed exchange. Any advice received from the Attorney General is made part of the public record of the proposed exchange. If the Attorney General has not responded to the request for review within the time granted, the State Director may proceed with the exchange. The Record of Decision shall discuss the consideration given to the Attorney General's advice in reaching the final decision on the proposed exchange.

REGIONAL COAL TEAM CONSULTATION

The Federal coal lands included in this proposed exchange are part of the Powder River Coal Production Region. All regional coal activity planning for this area is guided by the Powder River Regional Coal Team (RCT). Specifically, this team recommends to the Secretary of Interior whether BLM should lease coal, the amount of coal to be leased and which tracts of coal should be leased. This process is "regional coal activity planning."

The RCT also "serves as the forum for the Department — State consultation and cooperation in all other major Department coal management program decisions in the region, including preference right lease applications, public-body and small business set-aside leasing, *emergency leasing*, lease transfers and readjustments and *exchanges*" (United States Department of the Interior, Bureau of Land Management, 1988b. Powder River Regional Coal Team Charter). Thus their involvement and consultation is a necessary part of the proposed Bull Mountains exchange.

Although formal consultation with the RCT was not initiated at the time, the proposed Bull Mountains exchange was included as an agenda item at the December 1988 RCT meeting in Miles City, Montana. The RCT was fully briefed on the proposed exchange and its status. Further opportunity will be afforded the RCT to revisit the proposed coal exchange, alternatives to the exchange, and any associated impacts at crucial stages of the project. The RCT will also have an opportunity to advise whether the proposal is consistent with coal activities and competitive leasing in the region.

GOVERNOR'S CONSULTATION

BLM initiated formal consultation with the Governor of Montana in May 1988, as part of the exchange process. The Governor or his representative is also a voting member of Powder River Regional Coal Team. His comments and recommendations on the proposed exchange and alternatives will have considerable influence on BLM's ultimate decision.

BLM also met with representatives from the various state agencies having an interest in this project in March 1989 to identify their issues/concerns. At the request of the Montana Department of State Lands, BLM has included and analyzed two sections of State land in the EIS. Montana Department of State Lands, Lands Administration Division, is also a cooperating agency in the review of the EIS and will make the final decision on the disposition of the State lands involved.

OTHER CONSULTATIONS

American Indian Religious Freedom Act (AIRFA) consultation with the Crow Tribe was initiated in June 1988 on the selected Federal coal lands. This was initiated because the selected lands lie within aboriginal Crow territory.

To date, the Crow tribe is the only Native American group to identify the Bull Mountains area as their traditional tribal territory. As of yet, BLM has not received a response regarding the proposed exchange.

Threatened and endangered species consultation was initiated with the U.S. Fish and Wildlife Service in October 1988. The proposed exchange is not expected to cause significant impacts to threatened and endangered species.

RECORD OF DECISION/NOTICE OF REALTY ACTION/NOTICE OF LEASE SALE

Thirty days after the final EIS is released, a decision on the proposed exchange will be made. All decisions relevant to the EIS are recorded in a Record of Decision (ROD) which will be available to the public. If the final decision is to consummate the exchange of lands, BLM will issue a notice of realty action notifying all interested parties of our intent to pursue the exchange of lands. The public and the Governor have 45 days to respond. After 60 days, the exchange can be completed and deeds/patents exchanged. The Notice of Realty Action would be issued simultaneously with the Record of Decision.

Should BLM decide to lease the Federal coal, then BLM will have to make a recommendation to the Powder River RCT that the subject coal lands be leased. The final leasing decision would be made by the Secretary of Interior through a favorable recommendation from the Powder River Regional Coal Team. If the Secretary decides to lease coal, BLM would initiate regional coal activity planning and would eventually issue a Notice of Lease Sale on these coal lands if they passed the coal screening process and were carried forward as a lease tract.

If the Powder River Coal Production Region was decertified or if these counties were no longer a part of the Coal Production Region, then BLM could pursue a lease-by-application or emergency lease sale. Under the lease-by-application process, BLM receives the application, applies the necessary coal screens, prepares environmental documentation, and then issues a Notice of Lease Sale on the subject coal lands. Likewise, this process would occur with an emergency lease sale, except this leasing process is normally used to maintain an existing mining operation and requires that certain qualifications be met by the applicant (United States Department of the Interior, Bureau of Land Management, 1987a. 43CFR3425.1-4).

In all cases, the public has 30 days to respond after the Notice of Lease Sale is published and before the lease sale. The Notice of Lease Sale *may* or *may not* be issued simultaneously with the Record of Decision. The leasing process used to lease the coal would determine when the Notice of Lease Sale is issued.

COMMENT PROCEDURES

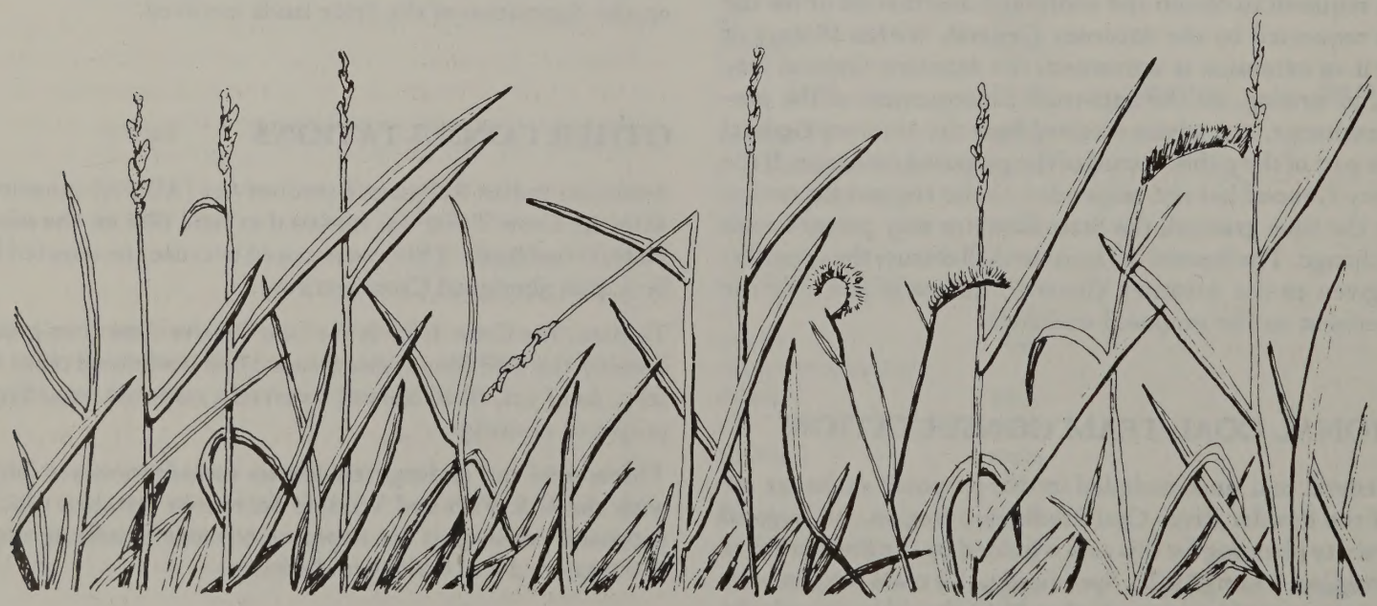
Comments on this document may be submitted for 60 days after BLM publishes the Notice of Availability in the Federal Register. Comments should be sent to Mat Millenbach, District Manager of the Miles City District, at the following address:

Bureau of Land Management
Miles City District Office
P.O. Box 940
Miles City, MT 59301
Attn: Bull Mountains Project Manager

All comments received during the comment period will be considered in the decision process. For each substantive comment received on the document or at the public meetings, a BLM response will be provided in the Final EIS.

Authorizing Actions Needed

A number of agencies are involved in the review of the EIS. BLM has the primary responsibility for preparation of the EIS and will make the final decision on the disposition of the federal coal lands involved. Montana Department of State Lands, Lands Administration Division, is a cooperating agency in the review of the EIS and will make the final decision on the disposition of the State lands involved. If the Federal coal lands are exchanged or leased and the company proceeds as planned, a number of agencies will be involved in the issuance of permits needed for a mining operation. Major Federal, State and County authorizing actions are listed in Appendix 2.



CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

Introduction

Further refinement of the proposed action, alternatives and development scenarios were formulated from meetings and correspondence with Meridian and YCC, scoping concerns and issues, and BLM personnel. Alternatives other than the proposed action, i.e., the exchange of Federal coal lands for private high value recreation and wildlife lands, include two coal-for-coal exchange alternatives, a leasing alternative and no action. Each alternative represents a reasonable approach to resolving various issues and concerns.

Under the exchange alternative, the subsequent development of these lands as a small underground room and pillar mining operation producing 0.5 million tons of coal per year (most likely development, Figure 2.1) is analyzed along with a 3.0 million tons of coal per year underground long-wall mining operation, (maximum development, Figure 2.2). A leasing alternative with the same two developmental scenarios is also analyzed, the only difference being that the lands involved in the leasing alternative include a State section, T.6N.,R.27E., Section 16 (640 acres) and part of another section of Federal coal land, T.6N.,R.26E., Section 24 (197.59 acres of which 148 acres contain recoverable coal). There are also parts of several other sections of private coal lands that differ (Figure 2.3).

The coal-for-coal exchange alternatives address anticipated socio-economic differences, particularly the loss of royalties, that one would expect between the exchange of coal-for-land and the exchange of coal-for-coal. The development of the Bull Mountains coal under the mirror image coal-for-coal exchange alternative is not addressed because it is similar to the development impacts under the proposed action. Likewise, the development of the Peabody coal in the Peabody Big Sky Area B Mine is not addressed because these coal lands are fully addressed in the Peabody Big Sky Mine—Area B EIS. Finally, the no-action alternative represents denial of the exchanges and denial of leasing, in essence, a no-development alternative.

Coal Land Use Screens

Coal land use planning involves four planning screens to determine whether the coal is acceptable for further consideration for leasing or exchange. The four coal screens are as follows:

development potential of the coal lands
unsuitability criteria application
multiple land use decisions that eliminate Federal coal deposits
surface owner consent

Only Federal coal lands that pass these coal screens are given further consideration for leasing or exchange. In the Billings RMP, coal land use planning was completed for the Bull Mountains coal field. Appendix 3 shows the results of that effort.

The Billings RMP Record of Decision states that "all the Federal coal which is mineable by underground methods is suitable for further consideration for leasing or exchange pending further study. The BLM will not apply coal unsuitability criteria to these areas until a site specific mine plan is filed, detailing the location of surface facilities" (United States Department of the Interior, Bureau of Land Management, 1984a. Billings RMP).

Surface owner consent, one of the coal screens, merits discussion. The surface owner consent provisions of the Surface Mining Control and Reclamation Act do *not* apply if the split estate coal is to be mined by underground mining techniques. BLM and Meridian have agreed that *only* underground mining would be allowed on the Bull Mountains Federal coal lands. This will be handled through an appropriate provision prohibiting surface mining within the patent or through a separate arrangement.

Unsuitability criteria, another coal land use planning screen, also deserves discussion. Before BLM can exchange or dispose of Federal coal lands, the application of unsuitability criteria are relevant and will be applied (United States Department of the Interior, Bureau of Land Management, 1987a. 43CFR2200.1(d)). Normally, Federal coal lands that will be mined by underground techniques are exempt from the application of unsuitability criteria, except when there are surface operations or surface impacts incident to an underground mine. In those cases, unsuitability criteria are relevant and must be applied to the Federal coal lands (United States Department of the Interior, Bureau of Land Management, 1987a. 43CFR3461.2).

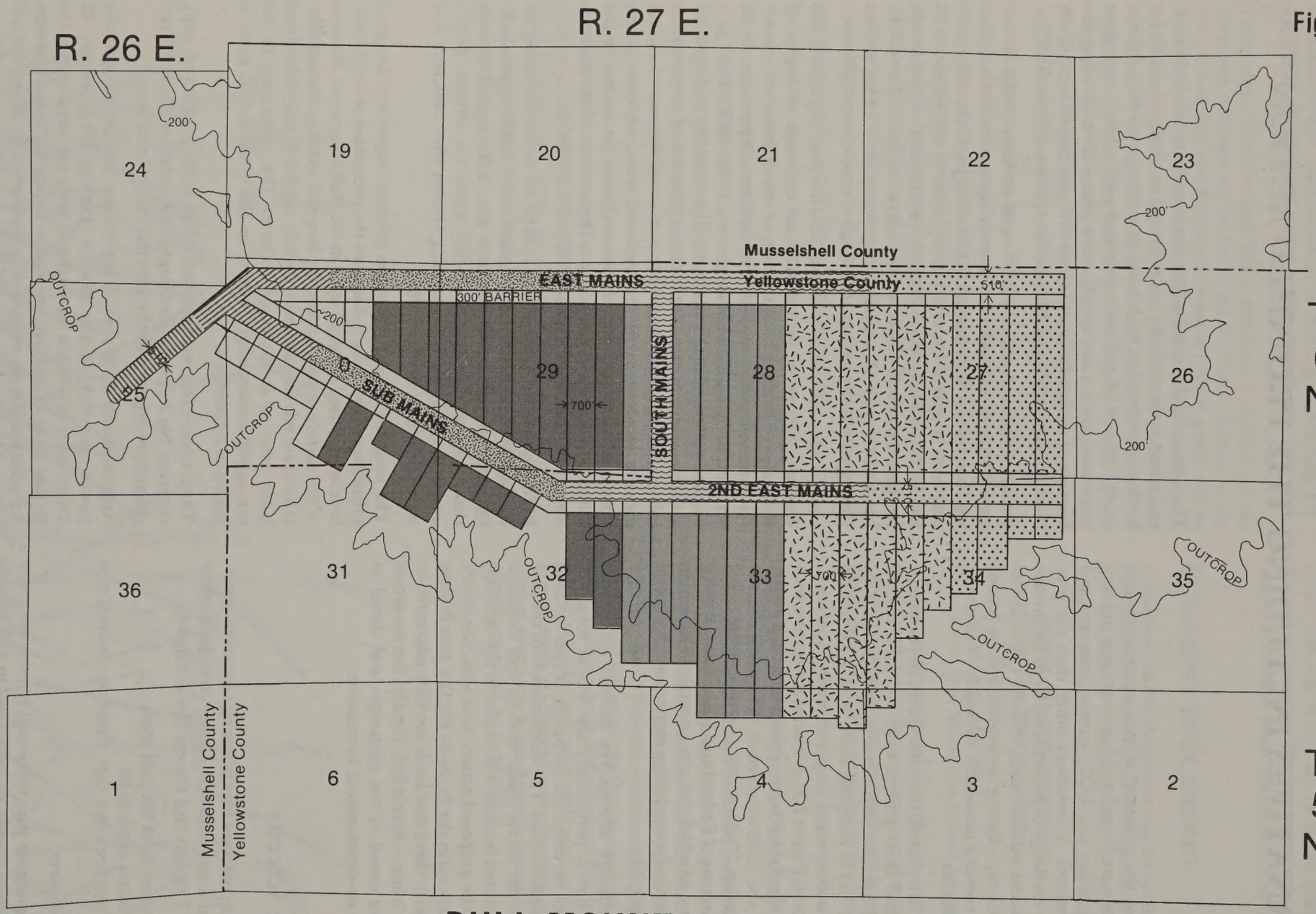
BLM applied the unsuitability criteria for *surface coal mining* on the Bull Mountains coal field in the Billings RMP (Appendix 4). Only certain unsuitability criteria were fully applied because there was insufficient data to fully apply the criteria. BLM's intent was to apply the remaining criteria after sufficient data was acquired or when needed.

The longwall mining technique involves controlled, designed subsidence. Appendix 5 discusses the prediction of subsidence for the proposed longwall mine in the Bull Mountains. Because of the surface impacts caused by longwall mining, unsuitability criteria are relevant and must be fully applied to the Federal coal lands prior to an exchange or lease. The application of the remaining unsuitability criteria to the Federal coal lands is shown in Appendix 4.

Three criteria that were applied, criterion No.2 (rights-of-way), criterion No.3 (roads, dwellings) and criterion No.16 (floodplains), are relevant to the selected Federal coal lands.

Approximately 2,750 feet of the Fergus Electric Cooperative power line right-of-way crosses T.6N.,R.27E., Section 32, S½NE¼ and NW¼SE¼. Federal coal lands encompassed by this 20 foot right-of-way are unsuitable for mining (approximately 1.3 acres) unless an exception is applicable. An exception will require a written agreement from Fergus Electric Cooperative to relocate the right-of-way.

Figure 2.1



LEGEND

PROGRESS	Yr. No.	PROGRESS	Yr. No.
	1		5-10
	2		10-20
	3		20-30
	4		30-40

BULL MOUNTAINS ROOM AND PILLAR MINE PLAN
EXCHANGE ALTERNATIVE

0.5 Million Tons Per Year Annual Production

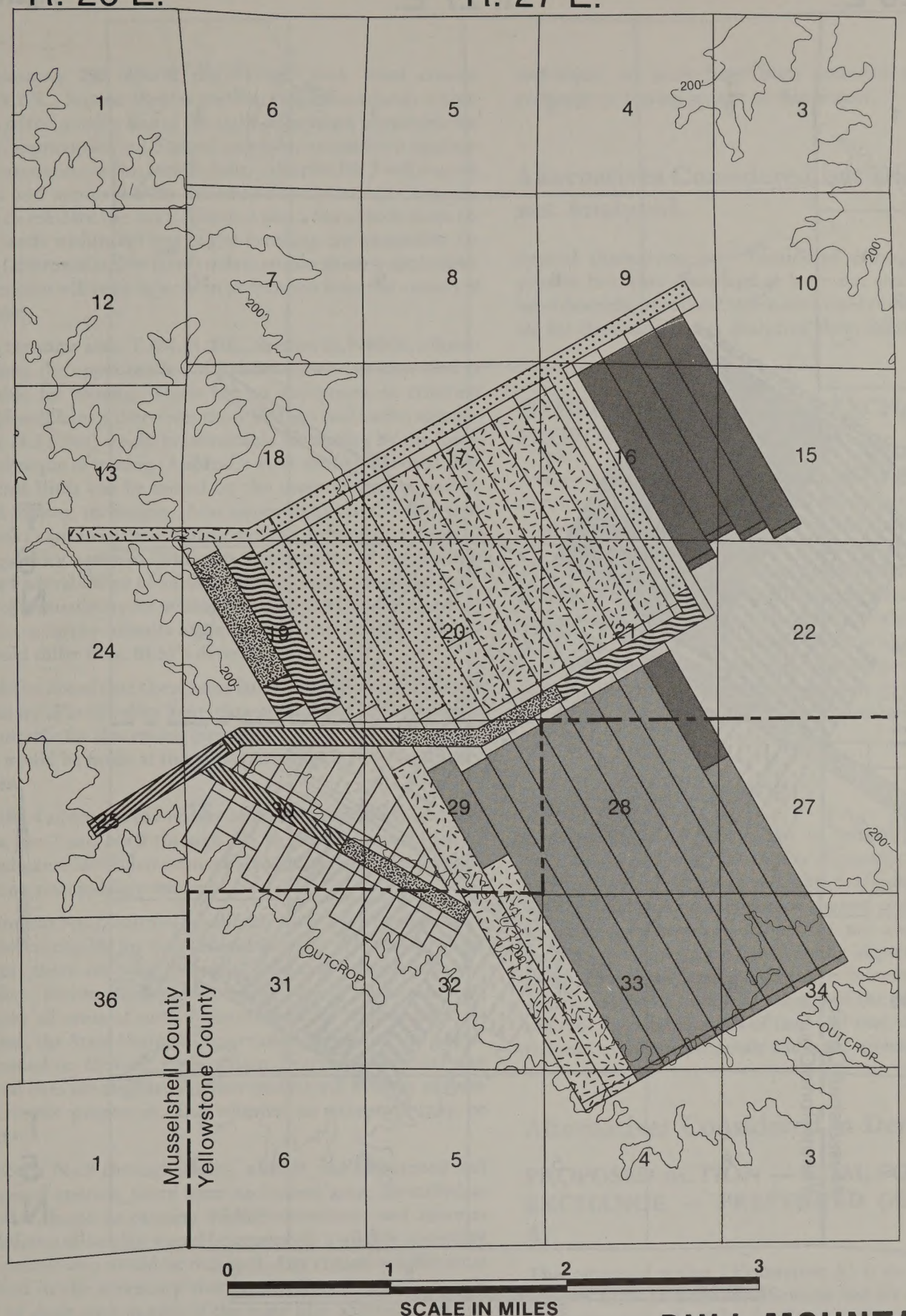
0 1 2 3

SCALE IN MILES

-N-

Source: Yellowstone Coal Company, November 1988.

Figure 2.2



LEGEND

PROGRESS	Yr. No.
	1
	2
	3
	4

PROGRESS	Yr. No.
	5-10
	10-20
	20-30
	30-40

BULL MOUNTAINS LONGWALL MINE PLAN EXCHANGE ALTERNATIVE

0.5-3.0 Mill. Tons/Year Annual Production

Source: Meridian Minerals Company, November 1988.

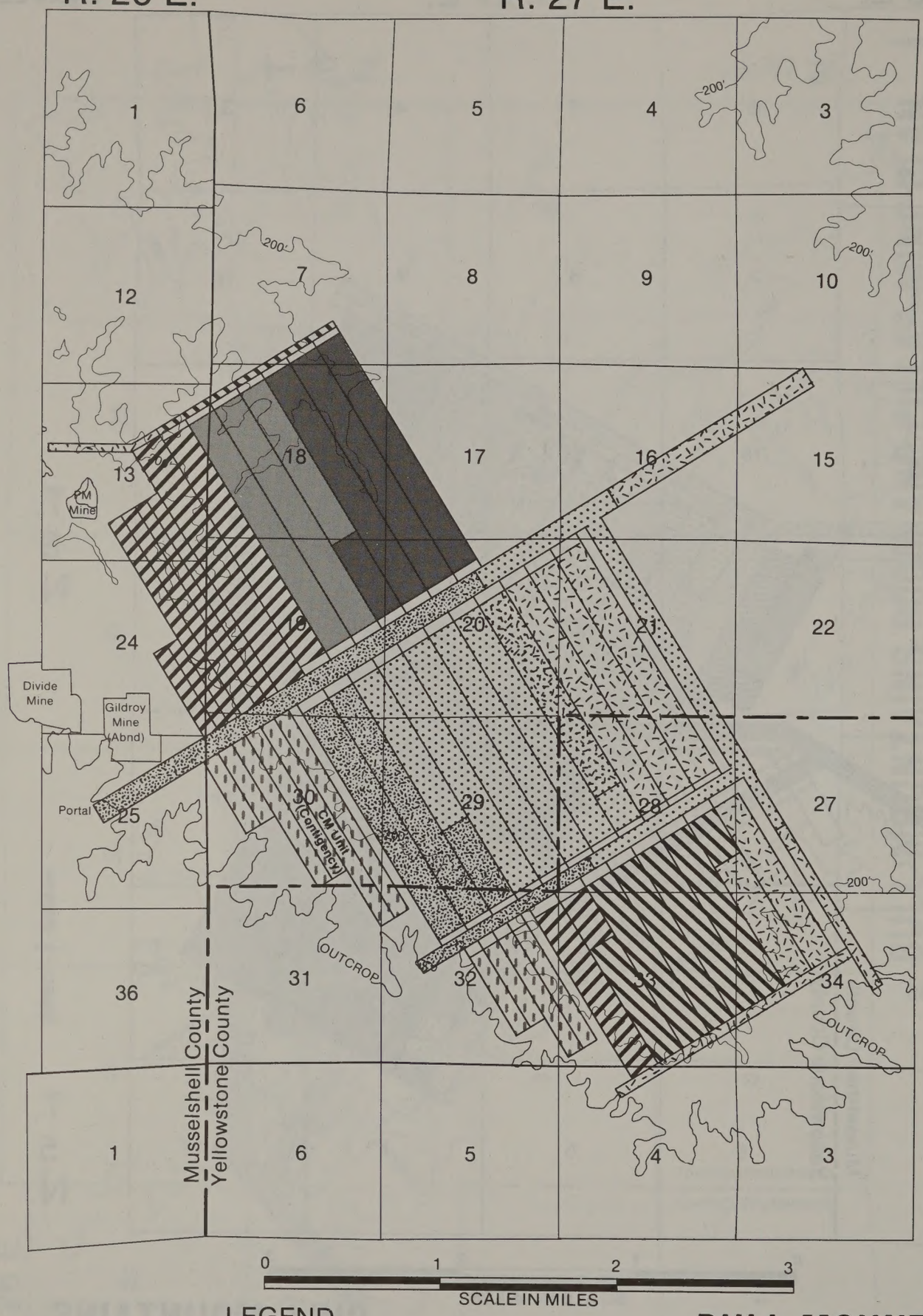


Figure 2.3

LEGEND

PROGRESS	Yr. No.	PROGRESS	Yr. No.	PROGRESS	Yr. No.
	1-5		16-20		31-35
	6-10		21-25		Continuous Miner Unit/ Contingency Area
	11-15		26-30		

BULL MOUNTAINS LONGWALL MINE PLAN LEASING ALTERNATIVE

0.5-3.0 Mill. Tons/Year Annual Production

Note: Continuous Miner Machine would be used in this area to mine coal when not used in advancing portals and entries in the Longwall Mining Operation.

Source: Meridian Coal Company, 1988.

Approximately 250 feet of the Fattig Creek Road crosses T.6N.,R.27E., Section 18, NW¼NW¼. Federal coal lands within 100 feet of the outside line of the right-of-way are unsuitable for mining (approximately 1.5 acres) unless an exception is applicable. An exception to this unsuitability criterion No.3 will require consent and approval from the Musselshell County Commissioners to relocate the road. There is also a home in Section 18, NW¼; lands within 300 feet of the dwelling are unsuitable for mining (approximately 6 acres) unless an exception is applicable. An exception will require written permission from the owners of this home.

Within the same area, T.6N.,R.27E., Section 18, N½N½, a floodplain along the upper reaches of Rehder Creek was identified as unsuitable for mining. There are no exceptions to criterion No.16 (floodplains); therefore, these Federal coal lands (approximately 24.5 acres) would be unsuitable for mining by the longwall technique of mining (Appendix 4). It should be noted that these coal lands can be mined by the room and pillar underground mining technique. Also noteworthy, is the fact that BLM makes an initial determination of the unsuitability criteria; the regulatory agencies (Montana Department of State Lands and the Federal Office of Surface Mining) make a final determination of unsuitability for mining based on BLM's determination after the company submits a mine plan. Their final determination could differ from BLM's determination.

It should be noted that these same lands were also identified as a preliminary alluvial valley floor (data preliminary) and could also be unsuitable for this reason (criterion No.19). A final determination would be made at the mine plan stage by the regulatory agencies.

Appendix 4 addresses the results of the remaining unsuitability criteria, No.7 and No.9 through No.15. No additional Federal coal lands were identified as unsuitable for mining because of the remaining unsuitability criteria.

For criterion No.7, cultural resources, there have been no sites identified as eligible for the National Register of Historic Places; however, there are some potential sites that could qualify for eligibility. Before mining, a company would be required to inventory all areas of surface disturbance for eligible sites. At that time, the State Historic Preservation Office and the Advisory Council on Historic Preservation, determine whether any potential sites are eligible, whether mining will have an adverse affect on the properties, and whether an exception may be applied.

For criteria No.9 through No.15, wildlife and threatened and endangered species, there were no known areas identified as unsuitable, based on existing wildlife inventories and information. Before a mine plan would be approved, a wildlife inventory of the permit area would be required. Any critical wildlife areas identified in the inventory that qualified under these criteria would be dealt with as part of the mine plan approval.

In summary, three areas in T.6N.,R.27E., Section 18, N½, and one area in T.6N.,R.27E., Section 32 were tenatively identified as areas unsuitable for mining by the longwall mining technique. These findings are only BLM's determinations; the regulatory agencies will make a final determination of unsuitability for these areas after a mine plan is submitted. Since these areas can still be mined underground by the room and pillar mining technique, no areas have been excluded as unsuitable for exchange or leasing as part of this project.

Alternatives Considered but Dismissed or not Analyzed

Several alternatives were considered during the formulation process but were dismissed or were not analyzed in detail. A brief description of these alternatives and the underlying rationale for dismissing or not analyzing them follows.

OTHER COAL-FOR-COAL EXCHANGE PROPOSALS

A second coal-for-coal exchange proposal in the Bull Mountains that was considered was to trade BLM coal lands in the exchange proposal for Meridian coal lands on the north end of the Bull Mountains. Coal lands in both areas would be appraised and exchanged on a cash value basis. This proposal was dismissed by BLM because there was insufficient coal data for the coal lands on the north end of the Bull Mountains. Preliminary indications were that the coal on the north end was also a poorer quality coal. To make a rational decision on this type of exchange would require a very expensive drilling program to secure coal quality data; therefore, this proposal was dropped.

REDUCED EXCHANGE

Consideration has been given to reducing the size of the exchange. A reduced exchange is a possibility, as well as other combinations of exchange and lease configurations. Any one of these proposals or combinations thereof could become BLM's final decision; however, they were not analyzed in the EIS because the impacts are less than the impacts of the exchange alternative or the leasing alternative. In summary, BLM's final decision could be to reduce the size of the exchange, exchange the coal for combinations of land and coal, or combinations of reduced exchange proposals and lease agreements.

Alternatives Considered in Detail

PROPOSED ACTION — COAL FOR LAND EXCHANGE — PREFERRED (ALTERNATIVE A)

The proposed action (Alternative A) is to exchange 3,674.36 acres of BLM administered Federal coal for private high-value recreation and wildlife lands offered by Meridian Minerals. Surface ownership of the coal lands would be unaffected by the exchange proposal. Legal descriptions are shown in Tables 2.1 and 2.2 and the lands involved are shown in Maps 1 to 5.

The Federal coal being proposed for exchange is in alternating sections (a checkerboard pattern of Meridian Minerals and BLM administered Federal coal) and is part of the Mammoth-Rehder

TABLE 2.1

SELECTED FEDERAL COAL LANDS

Proposed Lands Selected by Meridian Containing Federal Coal to be Transferred to Meridian in Private Ownership

County	*Township*	*Range*	*Section*	*Description*	*Acres*
Musselshell	6N	27E	18	All (Frac.)	636.92
			20	All	640.00
			30	All (Frac.)	638.00
				Total	1,914.92
Yellowstone	5N	27E	4	Lots 1 to 4	159.44
	6N	27E	28	All	640.00
			32	N½,SE¼	480.00
			34	N½,SW¼	480.00
				Total	1,759.44
GRAND TOTAL (MUSSELSHELL AND YELLOWSTONE COUNTIES)					3,674.36

TABLE 2.2

OFFERED PRIVATE LANDS

Proposed Private Lands Offered by Meridian to be Transferred to BLM in Public Ownership (with BLM priorities)

County	*Township*	*Range*	*Section*	*Description*	*Acres*	*BLM Priority*
Madison	8S	1W	15	All West of East Bank of River	572.00	1
			25	Part N½NE¼ lying East of West Bank	48.00	2
	9S	1W	1	Lots 6,7, SW¼NE¼	77.45	3
				TOTAL	697.45	
Custer	9N	51E	35	All	640.00	4
Beaverhead	1N	13W	9	SW¼,NW¼NW¼	200.00	5
			17	Part lying SE of C/L of Big Hole River	608.00	5
Deerlodge			17	Part W½NW¼ lying West of C/L of Big Hole River	32.00	5
Beaverhead			19	Part lying SE of C/L of Big Hole River	489.92	5
Deerlodge			19	Part lying NW of C/L of Big Hole River	145.56	5
				TOTAL	1,475.48	

TABLE 2.2 (Continued)

OFFERED PRIVATE LANDS

Proposed Private Lands Offered by Meridian to be Transferred to BLM in Public Ownership (with BLM priorities)

County	*Township*	*Range*	*Section*	*Description*	*Acres*	*BLM Priority*
Carbon	9S	21E	1	Lots 1 to 4	197.06	6
			3	Lots 2 to 4,S½N½, S½	600.63	6
			5	N½,N½S½, S½SE¼ (Frac.)	560.44	6
			7	All (Frac.)	624.08	6
			9	NE¼,N½NW¼, S½SW¼	320.00	6
			11	All	640.00	6
			13	Lots 3,4	80.83	6
			15	N½,W½SW¼, E½SE¼,SW¼SE¼	520.00	6
			17	All	640.00	6
			19	All (Frac.)	626.16	6
			21	All	640.00	6
			23	All	640.00	6
			31	Lots 1 to 4	106.36	6
				TOTAL	6,195.56	
				TOTAL — TOP 6 PRIORITY LANDS	9,008.49	
Broadwater	2N	2E	3	Lots 4,5,6 less 16 ac. Milwaukee R/W	79.04	None
			9	Lots 1,2, NW¼NW¼ less 10.38 ac. Milwaukee R/W	107.94	None
	4N	3E	7	Lots 1,2,4,5, S½NE¼,N½SE¼, less 16.17 ac. BN R/W	251.46	None
	5N	1E	3	SW¼	160.00	None
Custer	7N	51E	1	All	640.40	None
	8N	51E	35	Lots 1,4,5,8, SE¼NE¼,E½SE¼	238.25	None
	7N	52E	7	All	627.04	None
	12N	45E	5	All, Frac. less 1 acre	603.60	None
			17	All	640.00	None
Dawson	18N	56E	25	Part SW¼ lying NWerly, BN R/W less 41.25 ac. Townsite of Intake, less 0.52 ac. school site	52.93	None

TABLE 2.2 (Continued)

OFFERED PRIVATE LANDS

Proposed Private Lands Offered by Meridian to be Transferred to BLM in Public Ownership (with BLM priorities)

County	*Township*	*Range*	*Section*	*Description*	*Acres*	*BLM Priority*
Dawson (continued)			35	Part Lots 1 to 4, lying NWerly of line 200 ft. NWerly from C/L of Yellowstone River Branch R/W	98.06	None
Gallatin	2N	2E	3	Lots 1,2,3,7,8,9, S½NE¼,E½SW¼, SE¼, less 29.13 ac. BN R/W	119.48	None
			9	NE¼SW¼, N½SE¼, less 0.52 ac. BN R/W	119.48	None
	3N	2E	27	Lots 1,4,6,7, E½E½, less 28.17 ac., BN R/W	304.11	None
Jefferson	5N	2W	19	All (Frac.)	654.56	None
			29	All	640.00	None
			31	Lots 1 to 6,NE¼, E½NW¼, NE¼SW¼, N½SE¼	635.46	None
Madison	1S	6W	31	All(Frac.)	664.56	None
	5S	5W	21	All(Frac.)	653.54	None
	6S	6W	27	SE¼	160.00	None
			35	S½(Frac.)	321.29	None
	7S	6W	1	All(Frac.)	650.20	None
	4S	8W	1	All(Frac.)	659.88	None
			13	All(Frac.)	639.16	None
			23	E½	320.00	None
			25	NW¼,Frac.E½	478.09	None
	4S	7W	19	Frac.SW¼	160.27	None
			31	Part of Lot 3 lying N of C/L of main channel of Big Hole River, NW¼	182.64	None
Musselshell	9N	26E	29	All	640.00	None
	10N	27E	27	E½,less 1.23 acres	318.77	None
Prairie	13N	48E	25	All	640.00	None
			27	E½	320.00	None
			35	All	640.00	None
	13N	47E	21	All	640.00	None
				TOTAL	23,423.48	

Coal Field which encompasses 85 square miles in the Bull Mountains area (Figure 2.4). This coal field has several coal beds, but only two coal beds are notable, the Mammoth and the Rehder. Only the Mammoth coal bed which averages 10.2 feet in thickness is considered an economically mineable deposit.

The in-place Federal coal reserves included in the exchange application total 54.5 million tons. Depending upon the mining technique used, 43.6 million tons of coal are recoverable by a long-wall mining operation and 27.3 million tons of coal are recoverable by a room-and-pillar mining operation. The Federal coal under consideration for exchange has been determined to have a fair market in-place value of $730,000. This value was determined by the BLM's Northwest Regional Evaluation Team.

In return for the Federal coal under consideration for exchange, BLM selected lands from the Meridian offered lands (Table 2.2). Only the top six priority acquisition lands are discussed, since the preliminary value estimate for the Federal coal was less than the total appraised value of the top six priority acquisition lands. This exchange, like all exchanges, must be equal value for equal value. If the final coal value is less than the total value of the top six priority lands, then any difference in value would be considered a donation from Meridian to the United States. A brief discussion and description of the top six priority acquisition lands follows.

Priority Lands Nos.1,2,3 — These three parcels of land are located in Madison County and total 697.45 acres. All three parcels are riverfront properties and would provide additional public access to the Madison River. Primary anticipated use by the public would be fishing and dispersed recreation, such as sight-seeing and picnics.

Priority Lands No. 4 — This 640 acre parcel of land is located in Custer County and adjoins a large block of public land with public access. These lands are prime mule deer habitat and receive extensive use by the public during hunting season.

Priority Lands No. 5 — These three parcels of land in Beaverhead and Deer Lodge Counties total 1475.48 acres. The lands border the Big Hole River. The lands are critical elk and mule deer habitat. Primary anticipated use by the public would be fishing and big game hunting. Acquisition of these tracts would provide access to the Big Hole River and would ensure access to 10,000 acres of National Forest lands.

Priority Lands No. 6 — These thirteen parcels of land are located in Carbon County and total 6,195.56 acres. These lands contain endangered plant species habitat and mule deer habitat. Primary anticipated use by the public would be big game hunting. Public access to the area would be improved by acquisition of these lands.

MIRROR IMAGE COAL-FOR-COAL EXCHANGE (ALTERNATIVE B)

Under the mirror image coal for coal exchange (Alternative B), the Federal and Meridian coal in the project area would be split into two logical mining units of approximately equal size and value. Meridian would get one unit, BLM would get the other unit.

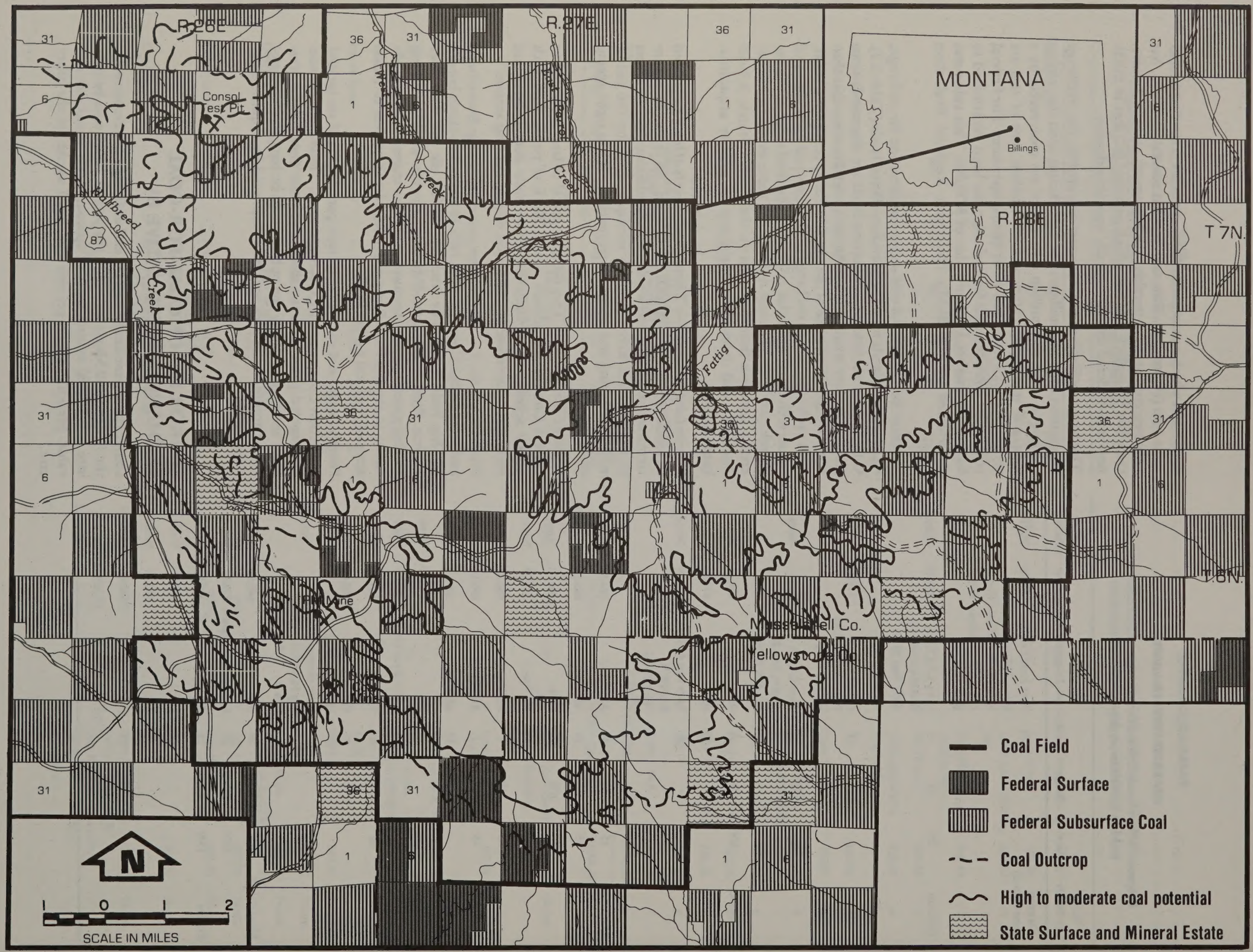


Figure 2.4 — Bull Mountains Coal Field

Source: USDI-BLM, Billings RMP, 1984

About 32.7 million tons of in-place Federal coal in the southern half of the project area would be exchanged for 30.5 million tons of in-place Meridian owned coal in the northern half of the project area. This alternative would provide a block of private coal of 70.8 million tons in the south half and a block of Federal coal of 60.2 million tons in the north half. Figure 2.5 shows Meridian and Federal coal that could be exchanged. Table 2.3 shows the coal reserves.

The south tract would have sufficient recoverable reserves to sustain a mine for 22 years assuming a longwall operation at 3.0 million tons annually and five years to reach full production. The north tract would sustain a similar mining operation for 19 years. With the addition of State Section 16 in the northern half there would be sufficient recoverable reserves for 23 years.

For a room and pillar mine operating at 0.5 million tons per year, and five years to reach full production, there would be sufficient recoverable reserves for 69 years in the south tract and 52 years for the north tract. Mine life could be expanded an additional 18 years if State Section 16 was included in the north tract.

If a larger mining operation began in the south tract, it is likely that the operation would eventually lease the Federal coal in the north tract. Any coal leasing would be done through the standard competitive process.

TABLE 2.3

MIRROR IMAGE
COAL-FOR-COAL EXCHANGE
EXCHANGE SOUTH FEDERAL PARCELS FOR NORTH MERIDIAN PARCELS

Location	*Current Ownership*	*Coal Acres*	*Inplace Tons*[1]	*Room & Pillar Recoverable Tons*[2]	*Longwall Recoverable Tons*[3]	*Exchange Parcel Private to Federal*
			NORTH TRACT			
T6N,R26E						
Sec. 13	P	610.0	9.6	4.8	7.7	*
Sec. 24	F	519.0	7.9	3.9	6.3	
T6N,R27E						
Sec. 16	S	640.0	11.3	5.7	9.0	
Sec. 17	P	640.0	10.8	5.4	8.6	*
Sec. 18	F	650.0	10.8	5.4	8.6	
Sec. 19	P	643.0	10.2	5.1	8.2	*
Sec. 20	F	650.0	10.9	5.5	8.7	
	Federal	1,819.0	29.7	14.8	23.8	
	State	640.0	11.3	5.7	9.0	
	Private	1,893.0	30.5	15.3	24.4	
	Total	4,352.0	71.5	35.8	57.2	
			SOUTH TRACT			
						Federal to Private
T5N,R27E						
Sec. 3	P	19.5	0.5	0.3	0.4	
Sec. 4	F	84.0	1.8	0.9	1.4	*
T6N,R26E						
Sec. 25	P	49.0	0.7	0.3	0.6	
T6N,R27E						
Sec. 27	P	652.0	14.7	7.4	11.8	
Sec. 28	F	639.0	11.9	5.9	9.5	*
Sec. 29	P	635.0	10.1	5.1	8.1	
Sec. 30	F	413.0	6.4	3.2	5.1	*
Sec. 31	P	18.0	0.3	0.1	0.2	
Sec. 32	F	229.0	3.9	2.0	3.1	*
Sec. 33	P	618.0	11.7	5.9	9.4	
Sec. 34	F	345.0	8.8	4.4	7.0	*
	Federal	1,710.0	32.7	16.4	26.2	
	Private	1,991.5	38.0	19.0	30.4	
	Total	3,701.5	70.8	35.4	56.6	

[1]Millions of tons
[2]Millions of tons at a 50% recovery rate
[2]Millions of tons at an 80% recovery rate

Note: Slight variations in totals are due to rounding.

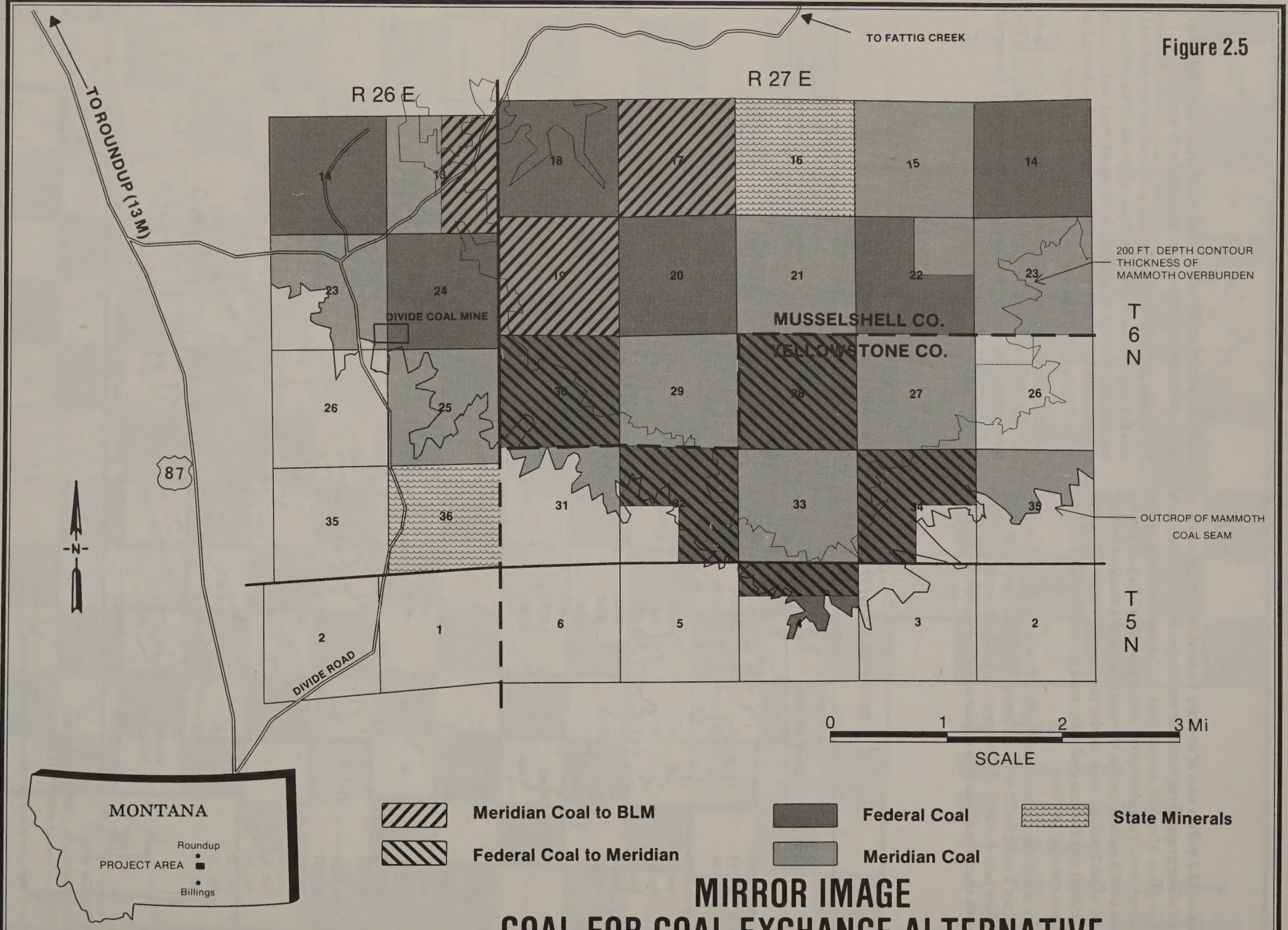


Figure 2.5
TO FATTIG CREEK
TO ROUNDUP (13 M)
R 26 E
R 27 E
200 FT. DEPTH CONTOUR
THICKNESS OF
MAMMOTH OVERBURDEN
DIVIDE COAL MINE
MUSSELSHELL CO.
YELLOWSTONE CO.
T 6 N
T 5 N
OUTCROP OF MAMMOTH
COAL SEAM
87
DIVIDE ROAD
N
0 1 2 3 Mi
SCALE
MONTANA
Roundup
PROJECT AREA
Billings
Meridian Coal to BLM
Federal Coal to Meridian
Federal Coal
Meridian Coal
State Minerals
MIRROR IMAGE
COAL FOR COAL EXCHANGE ALTERNATIVE

PEABODY COAL FOR COAL EXCHANGE (ALTERNATIVE C)

Alternative C considers the option of exchanging Federal coal in the Bull Mountains for Meridian coal in mining permit Area B of the Big Sky Mine south of Colstrip, Montana. The Federal coal lands would be exchanged for the Meridian offered coal lands. Figure 2.6 shows the Area B permit boundary and the proposed mining area. The offered Meridian coal is part of the Rosebud coal seam which averages 23.88 feet in thickness in this area. Portions of seven sections of coal were offered by Meridian of which BLM is considering three of these sections for possible exchange. The Meridian offered parcels fall within the Area B mine plan and contain about 575 acres underlain by an estimated 21.2 million tons of recoverable coal located in T.1N., R.40E., Section 25, Lots 2,3,4, SW¼,W½SE¼ and T.1N.,R.41E., Section 19, E½E½,NW¼SE¼ and Section 31, Lots 1,2,3, E½,E½W½. It should be noted that BLM would acquire the entire portions of those offered sections of coal under this alternative, not just the recoverable coal reserves. Surface ownership of these offered coal lands would be unaffected and would remain as it exists now.

The mine plan for permit Area B including the Meridian offered coal is described in the Application Proposal of the EIS for the Big Sky Mine — Area B (Montana Department of State Lands and United States Office of Surface Mining, Reclamation and Enforcement, 1988). The EIS was prepared by the Montana Department of State Lands and the U.S. Office of Surface Mining Reclamation and Enforcement and released November 1, 1988. The Montana Department of State Lands issued a mining permit to Peabody Coal Company for Area B on January 4, 1989.

Coal extraction in Area B would be by conventional strip mining (area mining) where the overburden above the coal is removed in parallel strips across the coal field until the area is completely mined. A dragline would excavate the overburden by creating wide trenches or cuts and deposit the material along the sides of the cut. The coal is then removed and overburden from the next strip is placed in the previously mined cut.

Additional information describing the method of mining, haul road, offices and maintenance facility, coal handling facilities, etcetera can be found in Chapter 2 of the Peabody Big Sky Mine — Area B EIS.

Under this proposal, selected Federal coal in the Bull Mountains and Meridian offered coal in the Peabody Big Sky Mine Area B would be appraised and exchanged on an equal cash value basis. An appraisal of the Meridian offered coal in mining permit Area B is being prepared and will be available for the final EIS. Mining of the BLM acquired coal could begin as early as the year 2000 and continue through 2012. Mining schedules and plans for the Meridian acquired coal in the Bull Mountains would be the same as described in the proposed action.

The amount of coal that BLM could acquire through this alternative depends on the appraised value of the Meridian offered coal. Since the appraisal is pending, a possible range of the amount of coal that BLM might acquire was developed. For analysis purposes in this draft, the impact assessment of all of the Meridian offered lands will be analyzed as the upper limit. The lower limit was set at seven million tons and would come from Section 25. F.O.B. sale price of the coal at the Big Sky Mine between March 1988 and March 1989 averaged $9.98 per ton.

LEASING (ALTERNATIVE D)

The Federal coal being considered for exchange could be leased competitively (Alternative D). Leasing could occur through a regional coal lease sale within the regional activity planning process *or*,if the Coal Production Region is decertified or partially decertified, through the lease-by-application process.

In 1979, the Department of the Interior issued regulations implementing a Federal coal leasing program consistent with the Leasing Amendments Act of 1976 and other laws passed in the 1970s. Key features of the program include designation of Federal Coal Production Regions, the use of regionally-based coal teams, the integral study of market conditions in support of major leasing decisions, and the use of competitive lease sales. It also contains provisions for the leasing of coal in response to applications in areas where Federal coal resources are in less demand. Twelve coal production regions were designated nationally, each with a regional coal team. In the last several years, all of the coal production regions, except the Powder River Region, have been decertified.

On February 9, 1989, a Federal Register Notice soliciting public comment on the decertification of all or a portion of the region was published. Partial decertification (the deletion of Yellowstone, Musselshell and Golden Valley counties or deletion of all counties in Montana from the coal region) or decertification of the entire region will be included on the agenda of the next RCT meeting.

The RCT serves as the Secretary of the Interior's major forum for balancing regional and national interests as a way of assuring that both Federal and State concerns are given proper consideration. The Federal coal program provides for two methods of competitive Federal coal lease sales. These methods are regional activity planning and lease-by-application. Emergency leasing, under certain circumstances, can occur within a Federal Coal Production Region.

Regional Activity Planning

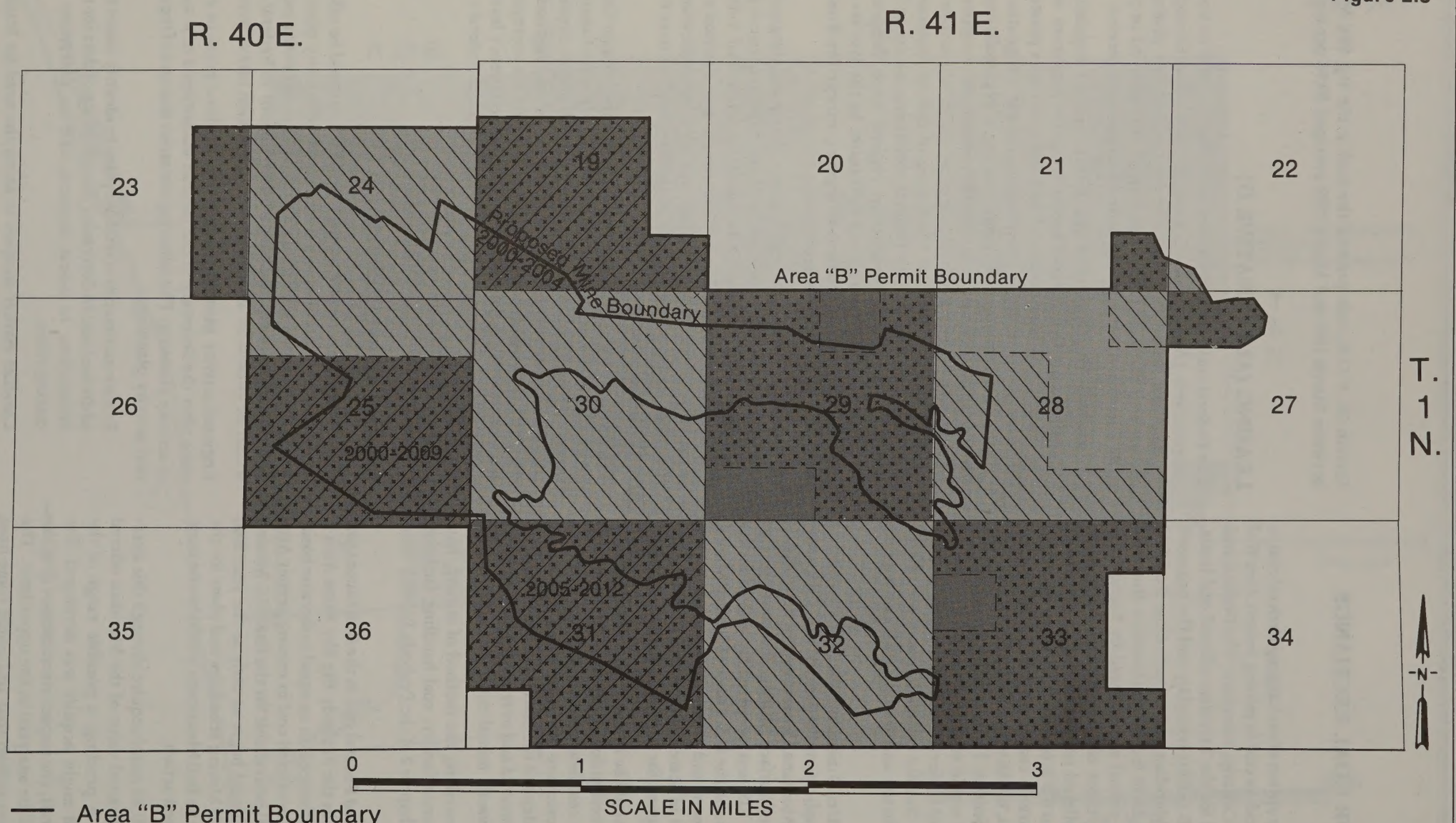
About 56.9 million tons of in-place Federal coal could be offered for lease in this alternative if a new round of activity planning was authorized and assuming a 3.0 million ton per year production rate. It is anticipated that a lesser amount of Federal coal would be offered for lease at a lower production rate of mining.

Regional activity planning requires up to three years to complete after the Secretary of the Interior authorizes a new round of activity planning. The following are major features of regional coal activity planning:

Review summaries of land use plans to identify issues to be addressed and to determine the adequacy of data for tract delineation, to assess impacts, and to determine fair market value.

Conduct market analyses to assess the need for leasing.

Figure 2.6



PEABODY
COAL FOR COAL EXCHANGE ALTERNATIVE
BIG SKY MINE AREA "B"

Source: Meridian Mineral Company, 1988.

Call for, and screen, expressions of leasing interest.

Delineate specific tracts.

Establish a regional leasing level.

Prepare tract profiles for site-specific impact assessment.

Rank coal tracts for desirability of leasing.

Select tracts and identify leasing alternatives.

Prepare cumulative impact analysis through a regional lease sale EIS.

Recommend tracts for lease offering.

Set sale schedule.

See Appendix 6 for further information on regional coal activity planning.

Lease-By-Application

If the Powder River Coal Production Region is decertified, BLM could lease the Federal coal by the lease-by-application process. Processing an application usually takes a year or longer. For analytical purposes, it is assumed that the in-place 56.9 million tons of Federal coal reserves would be offered for lease. Generally the process includes the following:

Review of the application.
Determine if application is in conformance with land use plans.
Prepare maximum economic recovery report.
Prepare site-specific environmental analysis.
Prepare fair market value analysis report.
Consult with governor and attorney general.
Reject application or hold competitive sale.

Appendix 6 further describes the leasing-by-application process.

Emergency Leasing

An emergency lease application is the other type of coal lease which can be accepted in a Federal Coal Production Region. Processing an emergency lease application is similar to the lease-by-application process discussed above. Leases issued as a result of an emergency lease application are limited to eight years of recoverable reserves and some portion of the leased coal must be used within three years (Appendix 6).

In theory it is possible to obtain an emergency coal lease to maintain a new mine. However, this was not the intent of the emergency lease regulations. It is also doubtful that a company would make the financial commitment to open a mine without control of adequate reserves. It is equally improbable that a company could obtain long term contracts without sufficient reserves to fill the contracts.

State Coal Status

As part of Meridian's efforts to secure long-term coal reserves in the Bull Mountains, they submitted three coal lease applications to the Montana Department of State Lands (DSL) for the following state-owned lands:

T.6N.,R.27E., Section 16
T.6N.,R.26E., Section 36
T.7N.,R.26E., Section 36

DSL then requested that BLM consider evaluating the State lands in the EIS, if possible. T.6N., R.27E., Section 16 was relatively easy to address and is included in the EIS under the leasing alternative.

T.6N.,R.26E., Section 36 lies outside of the Bull Mountains coal field and has no currently marketable coal. Per discussion with Meridian and DSL, it was determined that the company wanted these lands for surface facilities and any associated rights-of-way needed for the mining operation. Since a state coal lease does not necessarily grant surface rights, the company will probably withdraw this coal lease application. The mining company would then submit an application for rights-of-way for roads or other transportation needs. Likewise, the mining company would apply for a land use license, easement or special lease for any surface facilities associated with the mining operation, when needed. DSL would address the site-specific resource analysis as part of their environmental assessment for the project at the time they receive the company's application.

T.7N.,R26E., Section 36 is within the Bull Mountains coal field and is underlain with recoverable coal reserves. However, these lands are not analyzed in the EIS because this State section is several miles outside the geographic area of consideration this EIS is designed to address.

Other Federal Coal

Under the leasing alternative, BLM included 197.59 acres of Federal mineral estate which contains 148 acres of recoverable coal reserves in T.6N.,R.26E., Section 24 for discussion and analysis. These additional Federal coal lands, containing an estimated 2.4 million tons of in-place coal, were not included in the proposed exchange application because Meridian was concerned with interfering with the Divide/Storm King mining operation and that company's long-term coal reserves.

The Divide/Storm King mine is located in T.6N.,R.26E., Section 24, W½SW¼ and was mining Federal coal under coal lease M-52647; however, the mine is not in operation at this time.

BLM is concerned with the recoverable Federal coal reserves within this section and insuring that the coal would be mined and not bypassed by a mining company. Therefore, 148 acres of recoverable Federal coal reserves within the 197.59 acres to be leased in this section are analyzed under the leasing alternative and would probably be included in a Federal coal lease in this area.

Current coal market conditions indicate that the Bull Mountains coal would not become economically feasible for development until market conditions approached a $20.00 to $30.00 minimum selling price (1990 dollars). This probably would not occur until 20 to 40 years in the future. Based on these assumptions, royalty stream flows were calculated using a $25 F.O.B. mine sale price starting in 2020 (mid-range). Using these figures, a 0.5 million tons of coal per year underground mine would generate

$13,367,592 in royalty payments over a forty year period. The discounted royalty payment value is $176,941 under this scenario (1990 dollars). A 3.0 million tons of coal per year underground mine would generate $76,622,000 in royalty payments over the forty year period with a discounted value of $1,008,208 (1990 dollars).

If BLM were able to lease the Federal coal immediately and it was developed, a 0.5 million tons of coal per year underground mine would generate $7,985,628 in royalty payments over the forty year period with a discounted value of $1,676,763 (1990 dollars). A 3.0 million tons of coal per year underground mine generates $45,773,000 in royalty payments over the same forty year period with a discounted value of $9,554,192 (1990 dollars).

NO ACTION (ALTERNATIVE E)

No Action (Alternative E) would continue present management as it exists now for all the lands. It is in essence a two-part no action alternative, i.e., denial of the exchange(s) and denial of the leasing. There would be no development of the Federal coal under this alternative.

Should BLM deny the exchanges, the Bull Mountains Federal coal lands included in the exchange application would remain in public ownership and would not be developed in the foreseeable future. The offered recreational properties would remain in private ownership as would the private coal.

Should BLM deny leasing in the Bull Mountains, the Federal coal lands would still remain in public ownership for development by future generations. There would be no immediate coal development unless it was done on private coal lands.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

A comparison of the impacts by alternatives is presented in Table 2.4. Detailed discussion of each of the alternatives and impacts is presented in Chapter 4.

TABLE 2.4

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred Coal for Land Exchange	*Alternative B Mirror Image Coal for Coal Exchange*	*Alternative C Peabody Coal for Coal Exchange*	*Alternative D Leasing*	*Alternative E No Action*
Summary	BLM would exchange 3,674 acres of Federal coal reserves containing 54.4 million tons of in-place coal in the Bull Mountains project area for 9008 acres of privately owned high value recreation lands in six parcels belonging to Meridian Minerals Company.	BLM would exchange 3701 acres with 32.7 million tons of in-place coal in the south tract of the Bull Mountains project area for 4352 acres with 30.5 million tons of in-place Meridian owned coal in the north tract (mining units would be of about equal size and value).	BLM would exchange an equal cash value of Federal coal in the Bull Mountains project area for an equal cash value of Meridian owned coal in the Big Sky Mine Area B. (Peabody tracts contain 575 acres underlain by 21.5 million tons of recoverable coal.)	BLM would lease some or all of the 3,482 acres of Bull Mountains project area Federal coal to Meridian (197.59 acres of additional Federal coal and 640 acres of State coal are considered under this alternative).	Continue present management as it exists now. No coal or lands would be exchanged or leased.
Socioeconomics Employment	Mine development would employ from 35 to 207 mine workers and create from 15 to 92 secondary jobs plus 26 railroad construction jobs. Thirty to 153 jobs would be filled by local hires: 70% from Billings, 20% from Roundup and 5% from Yellowstone and Musselshell counties. From 5 to 54 new in-migrants could be expected to move to the area with from 4 to 40 individuals living in Billings, 1 to 7 in Roundup and in the 3.0 million tons per year development scenario, 4 in Yellowstone County and 3 in Musselshell County.	Same as Alternative A	Same as Alternative A with minor impacts to Peabody tracts.	Slightly less than Alternative A. by Year 2020.	No change from baseline.

TABLE 2.4 (continued)

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred Coal for Land Exchange	*Alternative B Mirror Image Coal for Coal Exchange*	*Alternative C Peabody Coal for Coal Exchange*	*Alternative D Leasing*	*Alternative E No Action*
Income and Purchases	Mine will create from $887,480 to $5.3 million in job related income. The mine will spend locally from $1 million to $3.4 million per year.	Same as Alternative A.	Same as Alternative A with minor impacts to Peabody tracts.	Same as Alternative A.	No change.
Local Government Costs	Mine development would create major increases in road and maintenance costs for Musselshell County and minor increases in costs for Yellowstone County. Law enforcement and ambulance services would need to be increased but no new personnel or capital costs are expected for either county. —Madison County would lose $124/yr in property taxes but gain $523 in PILT payments: net gain, $398/yr. —Custer County would lose $164/yr in property taxes but would gain $480 in PILT payments: net gain $315/yr. —Beaverhead County would lose $364 in property taxes but gain $873 in PILT payments: net gain $609/yr. —Anaconda/Deerlodge Counties would lose $24/yr in property taxes but gain $133 in PILT payments: Net gain $108/yr. —Carbon County would lose $709/yr in property taxes but gain $4,646 in PILT payments: Net gain $3,937/yr.	Impacts to priority lands. N/A	Same as Alternative A. N/A to priority lands.	Same as Alternative A.	No change.
State and Federal Costs	Mine development would create major costs to the State for maintenance of U.S. Highways 87 and 312. Road life would be shortened. Increased revenues from fuel taxes, use fees and GVW fees. Foregone royalty payments would range from $8.0 million to $45.8 million. The discounted royalty values would range from $1.7 million to $9.6 million.	Impacts same as Alternative A. Federal royalty payments would be made on the available coal should it be leased.	Same as Alternative A.	State and Federal government would benefit from receipt of Federal coal royalty.	No change.

TABLE 2.4 (continued)

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred *Coal for Land Exchange*	*Alternative B* *Mirror Image Coal for Coal Exchange*	*Alternative C* *Peabody Coal for Coal Exchange*	*Alternative D* *Leasing*	*Alternative E* *No Action*
Local Government Revenues	Mine development would create from $100,000/yr. to $1 million/yr. additional revenues for Yellowstone County. Roundup schools would gain $100,000/yr. and Yellowstone County schools would gain $750,000/yr. from increased revenues. In the long term, Yellowstone County would realize a net gain in revenues while Musselshell County would lose revenues due to road maintenance costs.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	No change.
State and Federal Revenues	State would gain from $450,000/yr. to $2.6 million/yr. while the Federal government will gain from $500,000 to $2.9 million in new revenues.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A. Also, if BLM leased the Federal coal immediately, royalty payments would range from $8.0 million to $45.8 million. Discounted royalty values would be $1.7 million to $9.6 million. If BLM were not able to lease the Federal coal until market conditions were favorable for development (Year 2020), the royalty payments would range from $13.4 million to $76.6 million. Discounted royalty values would be $0.2 million to $1.0 million.	No change.
Demographics	No significant impacts would be felt by any municipality as the small number of the in-migrating population could be easily assimilated into the existing population.	Same as Alternative A.	Same as Alternative A with minor impacts to Peabody tracts.	Same as Alternative A.	No change.

TABLE 2.4 (continued)

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred *Coal for Land Exchange*	*Alternative B* *Mirror Image Coal for Coal Exchange*	*Alternative C* *Peabody Coal for Coal Exchange*	*Alternative D* *Leasing*	*Alternative E* *No Action*
Social Life	Perception by Roundup residents would be that the mine would revitalize depressed economy of Musselshell County, however, the small number of jobs would not provide a significant infusion of wage money into the economy to change much. Although the expenditures by the mining company would be significant to Musselshell County economy, not all jobs will be filled by county residents and only a portion of their income would be spent in-county.	Same as Alternative A.	Same as Alternative A with moderate impacts to natural and spiritual qualities of the environment and social life of the Northern Cheyenne tribe. Minor impacts to Rosebud County social life.	Same as Alternative A.	No change.
Community Services	The small number of workers and family members moving to Musselshell and Yellowstone Counties would have no significant impacts on community services. Increased traffic on U.S. Highways 87 and 312 would create the need to shift more enforcement duties from other parts of counties to the coal haul route.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	No change.
Housing	No impact. The small number of in-migrants would not impact available housing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	No change.
Transportation	Mine development would create from 17 to 99 additional commuter round trips per day on U.S. Highway 87. Coal hauling will create an additional 10 to 90 truck round trips per day on U.S. Highways 87 and 312. The accident rate on the haul route will likely increase from 30% to 70% with additional accidents at the railroad crossing of U.S. Highway 87.	Same as Alternative A.	Same as Alternative A with minor impacts to Peabody tracts.	Same as Alternative A.	No change.

TABLE 2.4 (continued)

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred *Coal for Land Exchange*	*Alternative B* *Mirror Image Coal for Coal Exchange*	*Alternative C* *Peabody Coal for Coal Exchange*	*Alternative D* *Leasing*	*Alternative E* *No Action*
Transportation (continued)	Roadway pavement conditions would deteriorate at an increased rate and annual maintenance costs would increase. To maintain the structural integrity of the three proposed construction projects on U.S. Highway 87 would cost an additional $70,000 to $78,000 per mile. Annual maintenance on U.S. Highway 87 would need to be increased by $50,000 per year and on U.S. Highway 312 by $90,000 to $100,000 per year. Traffic accidents with children and school buses would increase.				
Air Quality	No effect on climate. Particulate levels would increase somewhat but would still be within allowable concentrations even for the high level mining scenario. In the low development scenario the air separator process would be the largest contributor to particulate emissions while the wet benefication process used in the high development scenario would keep particulate emissions lower than expected.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
ACEC	No impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Cultural Resources	Subsidence in both development scenarios would have major impacts on rock art sites.	Same as Alternative A.	Same as Alternative A with minor impacts to Peabody tracts.	Same as Alternative A.	All impacts associated with mining would be avoided.
Agriculture	No impacts from low development scenario and little or no effect from the high development scenario. The railroad may change the vegetative distribution with changes in the drainage patterns.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.

TABLE 2.4 (continued)

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred *Coal for Land Exchange*	*Alternative B* *Mirror Image Coal for Coal Exchange*	*Alternative C* *Peabody Coal for Coal Exchange*	*Alternative D* *Leasing*	*Alternative E* *No Action*
Floodplains	No impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Native American Religious Concerns	No impacts on selected coal lands. A positive effect on offered private lands.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Threatened and Endangered Species	No impacts to selected coal lands. If rare plants should occur on the offered private lands they would be protected.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Hazardous Wastes	No impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Wetlands/ Riparian Areas	No impacts to selected coal lands. Would be managed for improvement on the offered private lands.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Wild and Scenic Rivers	No impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Wilderness	No impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Topography and Soils	Sink hole subsidence in areas of less than 40 feet of overburden would cause minor impact to topography. However, subsidence from the high development scenario would have major impacts to topography and yet would not be readily noticeable. Subsidence will have limited impacts to soils. Surface fissures and slope failure can cause altered drainage patterns, and change soil structure, permeability and infiltration rates.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Vegetation	Little or no impacts.	Same as Alternative A.	Same as Alternative A with negligible impacts to Peabody tracts.	Same as Alternative A.	All impacts associated with mining would be avoided.

TABLE 2.4 (continued)

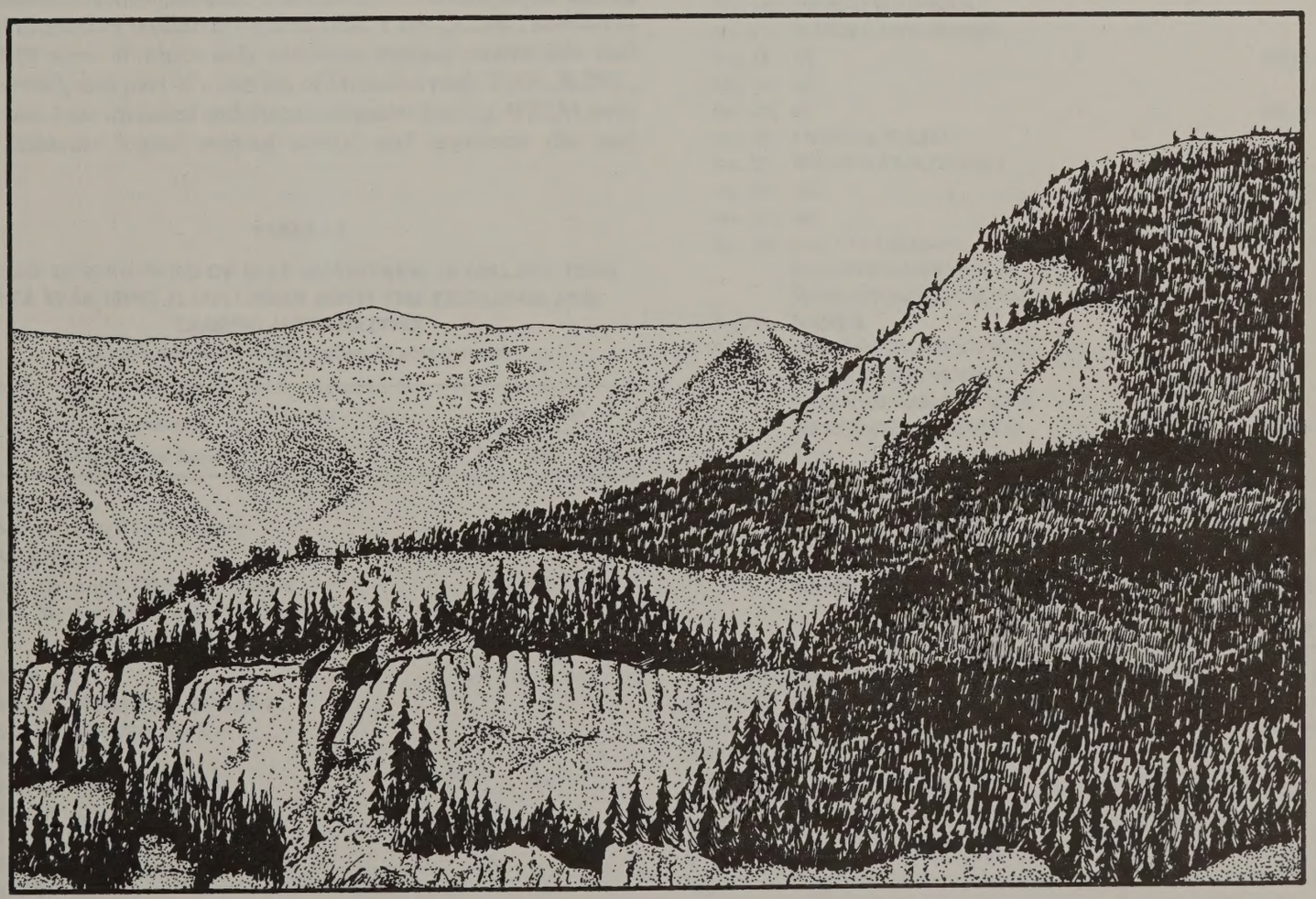
ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred *Coal for Land Exchange*	*Alternative B* *Mirror Image Coal for Coal Exchange*	*Alternative C* *Peabody Coal for Coal Exchange*	*Alternative D* *Leasing*	*Alternative E* *No Action*
Wildlife	Mine mouth and haul road activities would displace and disturb wildlife to a small degree. Major impacts from the railroad would be noise, human harassment and collisions. Most impacts could be mitigated. No effect on habitat quality and use of area.	Same as Alternative A.	Same as Alternative A with negligible impacts to Peabody tracts.	Same as Alternative A.	All impacts associated with mining would be avoided.
Oil and Gas	Ownership will remain with Meridian on the offered private lands. BLM would acquire surface owner rights.	N/A	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Mineral Materials/Mining Claims	On priority lands 1,2,3 and 5 no sales would be allowed. On priority lands 4 and 6 sales would be allowed. On all tracts, claims would be managed under existing laws and regulations.	N/A	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Hydrology	Impacts would be minimal on both surface and ground water under both development scenarios.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Recreation	Minimal impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Stratigraphy and Geology	50% to 80% of coal bed will be removed.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Subsidence	Subsidence will definitely occur but will have minimal overall impacts.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	All impacts associated with mining would be avoided.
Land Use	N/A	N/A	Minor impacts.	N/A	All impacts associated with mining would be avoided.
Esthetics	N/A	N/A	Minor impacts.	N/A	All impacts associated with mining would be avoided.
Noise	N/A	N/A	Minor impacts.	N/A	All impacts associated with mining would be avoided.

TABLE 2.4 (continued)

ALTERNATIVE COMPARISON AND IMPACT SUMMARY TABLES

	Alternative A—Preferred *Coal for Land Exchange*	*Alternative B* *Mirror Image Coal for Coal Exchange*	*Alternative C* *Peabody Coal for Coal Exchange*	*Alternative D* *Leasing*	*Alternative E* *No Action*
Opportunities Foregone					—No opportunity to manage high value lands. —No opportunity for royalty payments. —Priority lands will likely be sold and developed.



CHAPTER 3
AFFECTED ENVIRONMENT

Introduction

Lands described in this section are all lands involved with the proposed exchange and the alternatives. Present management, use and resource concerns are addressed.

Coal Lands

OWNERSHIP

Map 1 and Table 3.1 show all the coal lands in the Bull Mountains that are discussed in this chapter. The proposed action is to exchange 3,674.36 acres of Federal coal; however, the leasing alternative differs from the exchange alternatives in that additional coal lands are included under the leasing alternative. A section of State owned coal, T.6N.,R.27E., Section 16 (640 acres), part of another section of Federal coal, T.6N.,R.26E., Section 24 (197.59 acres of which only 148 acres contain recoverable coal reserves), and part of a section of Meridian coal, T.6N.,R.27E., Section 7 are included and discussed under leasing. If BLM were to delineate logical mining unit(s) and maximize the coal resource recovery, these coal lands would be included in the logical mining unit. Hence, these coal lands were included in the leasing alternative and are discussed under the affected environment of the coal lands.

Most of the surface above the Federal coal lands in the project area is privately owned. T.6N.,R.27E., Section 32 and T.5N.,R.27E., Section 4, N½NW¼ is public land administered by BLM. T.6N.,R.27E., Section 16 is State coal and surface administered by the Montana Department of State Lands.

TABLE 3.1

LEGAL DESCRIPTIONS OF BULL MOUNTAINS 3.0 MILLION TONS PER YEAR MINE PLANS UNDER BOTH THE EXCHANGE AND LEASING ALTERNATIVES
(Legals described to the nearest 40 acre parcels)

Alternative A *Coal for Land Exchange*	*Ownership* Fed	Mer	State
T.5N., R.27E.			
Sec. 4: Lots 2 to 4 inclusive	★		
T.6N., R.26E.			
Sec. 13: Lot 4, SE¼SW¼,SW¼SE¼		★	
Sec. 25: Lots 1 to 3 inclusive, SW¼NE¼, SE¼NW¼,NE¼SW¼,NW¼SE¼		★	
T.6N., R.27E.			
Sec. 9: NE¼SW¼,S½SW¼,SE¼		★	
Sec. 15: W½NW¼,SW¼		★	
Sec. 16: All			★
Sec. 17: E½,S½NW¼,SW¼		★	
Sec. 18: Lot 4, SE¼SW¼,SE¼	★		
Sec. 19: Lots 1 and 2, E½,E½W½		★	
Sec. 20: All	★		
Sec. 21: All		★	
Sec. 27: W½NW¼,SW¼		★	
Sec. 28: All	★		
Sec. 29: All		★	
Sec. 30: All	★		
Sec. 31: N½NE¼,SE¼NE¼,NE¼NW¼		★	
Sec. 32: N½,E½SE¼	★		
Sec. 33: All		★	
Sec. 34: W½NE¼,NW¼,N½SW¼,SW¼SW¼	★		

TABLE 3.1 (continued)

Alternative D *Leasing*	*Ownership* Fed	Mer	State	*Acres Leased*[2]
T.5N., R.27E.				
Sec. 4: Lots 2 and 3	★			79.72 ac.
T.6N.,R.26E.				
Sec. 13: Lots 1 to 4 inclusive, W½NE¼, S½NW¼,SE¼SW¼,W½SE¼		★		
Sec. 24: Lots 1 to 4 inclusive, NW¼NE¼, E½SW¼NE¼,E½NW¼SE¼[1]	★			197.59 ac.
Sec. 25: Lots 1 and 2, W½NE¼,SE¼NW¼		★		
T.6N., R.27E.				
Sec. 7: SE¼SW¼,S½SE¼		★		
Sec. 15: N½NW¼,SW¼NW¼		★		
Sec. 16: S½NE¼,SW¼,N½SE¼			★	
Sec. 17: W½NW¼,SW¼,SE¼SE¼		★		
Sec. 18: All	★			636.92 ac.
Sec. 19: All		★		
Sec. 20: All	★			640.00 ac.
Sec. 21: SW¼NE¼,W½,SE¼		★		
Sec. 27: W½NW¼,SW¼,SW¼SE¼		★		
Sec. 28: All	★			640.00 ac.
Sec. 29: All		★		
Sec. 30: Lots 1 to 3 inclusive, E½,E½NW¼,NE¼SW¼, W½SE¼SW¼,SE¼SE¼SW¼[1]	★			568.43 ac.
Sec. 31: N½NE¼		★		
Sec. 32: NE¼,E½NW¼,NW¼NW¼, SE¼SW¼NW¼,NE¼SE¼, N½NW¼SE¼,SE¼NW¼SE¼, NE¼SW¼SE¼,N½SE¼SE¼[1]	★			390.00 ac.
Sec. 33: All		★		
Sec. 34: W½NW¼NE¼,SE¼NW¼NE¼, SW¼NE¼,SW¼SE¼NE¼,NW¼, N½NE¼SW¼,NW¼SW¼, NW¼SW¼SW¼,NW¼NE¼SE¼, NE¼NW¼SE¼[1]	★			320.00 ac.
		Total		3482.66 ac.

[1]These parcels are described to the nearest 10 acres: The smallest aliquot part that can be leased by Federal Regulation.
[2]Total acres of Federal coal that could be leased under Alternative D leasing mine plan.

Although T.6N., R.26E., Section 36, also State land, is not over coal proposed to be mined, the surface lands may be affected by mining.

CURRENT MANAGEMENT

The current private landowners use these lands for livestock grazing. Glacier Park Company's private surface lands are leased to ranchers for livestock grazing. Public lands and State lands are also incorporated into livestock grazing allotments and are an integral part of the ranches in the area.

A power line right-of-way owned by Fergus Electric Cooperative traverses public land T.6N.,R.27E., Section 32. The right-of-way is 20 feet in width.

The subject coal lands are accessed from the westside by U.S. Highway 87 and the Divide Road, a dedicated paved county road. Several private two-track trails off the Divide Road traverse the coal lands on the west side. Coal lands on the north side can be accessed by the Fattig Creek Road, a dedicated graveled county road, that heads northeast from the Divide Road.

Likewise, several two-track trails from the Fattig Creek Road provide private access to the coal lands from the north. Access from the south and east can be gained by private roads and two-track trails that lead into the area.

AFFECTED ENVIRONMENT

Socioeconomics

ECONOMIC ENVIRONMENT

The economic study area for the selected Federal coal lands is in the southern portion of Musselshell County and the northern end of Yellowstone County (Map 12).

Industrial Sector Composition

The U.S. Bureau of the Census reported that in 1986 there were 119 private nonfarm establishments in Musselshell County with one or more employees (Table 3.2). Thirty-three of the 119 establishments were in the retail trade industry, 30 were in the services sector, and nine establishments were in the mining sector (including oil and gas extraction and services). Only one establishment in the county reported employing 50 or more people (services sector) and 80 of the 119 establishments reported employing fewer than five persons.

Major employers in Musselshell County include the Roundup Memorial Hospital and Nursing Home, oil and gas extraction services, and local governments including the school districts. The hospital is the only employer in the county which employs more than 50 persons (United States Department of Commerce, Bureau of the Census, 1986).

TABLE 3.2

PRIVATE NON-FARM ESTABLISHMENTS BY EMPLOYMENT SIZE — MUSSELSHELL AND YELLOWSTONE COUNTIES

Category	*Total Number of Establishments*	*Number of Employees*				
		1-4	*5-9*	*10-19*	*20-50*	*Over 50*
Musselshell County						
All Establishments	119	80	24	9	5	1
Mining	9	2	4	1	2	0
Construction	8	7	1	0	0	0
Manufacturing	4	3	1	0	0	0
Transportation	12	9	2	1	0	0
Wholesale Trade	8	5	1	1	1	0
Retail Trade	33	19	10	2	2	0
Finance, Insurance, & Real Estate	7	5	0	2	0	0
Services	30	22	5	2	0	1
Other	8	8	0	0	0	0
Yellowstone County						
All Establishments	4,093	2,333	823	489	316	132
Mining	71	44	8	8	7	4
Construction	326	221	49	37	16	3
Manufacturing	143	66	29	17	18	13
Transportation	214	98	39	29	30	18
Wholesale Trade	406	155	96	89	52	14
Retail Trade	944	416	243	145	100	40
Finance, Insurance, & Real Estate	382	267	54	33	21	7
Services	1,281	783	277	120	68	33
Other	326	283	28	11	4	0

Source: U.S. Department of Commerce, Bureau of the Census, 1986. County Business Patterns.

In contrast, within Yellowstone County, 4,093 private non-farm establishments reported employing one or more people (Table 3.2). Twenty-three percent (944) of the 4,093 establishments were in the retail trade industry and 31 percent (1,281) were in the services sector. Yellowstone County reported 132 establishments with more than 50 employees and 316 establishments with between 20 and 50 employees.

The Federal government and the Billings School District are the major employers in Yellowstone County, with each employing approximately 1,800 employees. Other primary employers in Yellowstone County include Deaconess Medical Center (1,200 employees), St. Vincent's Hospital (1,200 employees), city of Billings (660 employees), and Eastern Montana College (450 employees). Major private sector employers include Burlington Northern Railroad (400 employees), Interstate Brands Corporation (400 employees), Cenex (370 employees), and U.S. West Communications (350 employees).

Employment

Employment Characteristics

The farming and services industries are the major employers in Musselshell County, together employing nearly 40 percent of all county employees (Table 3.3). State and local governments in Musselshell County employ approximately 12 percent, while the mining industry employs about 7.4 percent of the county work force. In Yellowstone County, the major employers are in the retail trade (19.7 percent) and services industries (27.3 percent). Total government employment comprises about 12 percent of all employees in Yellowstone County. Employment in farming and mining industries in Yellowstone County total 2.1 percent and 1.5 percent of total employment, respectively.

TABLE 3.3

1985 EMPLOYMENT BY INDUSTRY AS A PERCENT OF TOTAL — STATE OF MONTANA, MUSSELSHELL COUNTY, AND YELLOWSTONE COUNTY

Category	*Montana*	*Musselshell County*	*Yellowstone County*
Total Employment	100.0%	100.0%	100.0%
Farm	8.0%	17.9%	2.1%
Private	73.8%	67.5%	85.9%
Agricultural Services	1.2%	1.7%	0.8%
Mining	1.9%	7.4%	1.5%
Construction	5.5%	4.9%	6.6%
Manufacturing	6.0%	4.8%	5.2%
Transportation and Utilities	6.3%	3.6%	7.7%
Wholesale Trade	4.3%	3.5%	8.9%
Retail Trade	17.9%	16.4%	19.7%
Finance	6.6%	3.8%	8.4%
Services	24.1%	21.6%	27.3%
Government	18.2%	14.6%	12.0%
Federal (civilian)	3.2%	1.1%	2.5%
Federal (military)	2.0%	1.3%	1.0%
State and Local	13.0%	12.2%	8.5%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1985.

The civilian labor force in Musselshell County increased by approximately 400 persons between 1970 and 1980 (Table 3.4). From 1980 to 1985, the labor force increased to 1,984, but decreased to 1980 levels by 1988, reflecting the declining economic conditions of the county. In Yellowstone County, the employment situation is almost identical to the state and Musselshell County. The labor force in Yellowstone County increased from 35,170 in 1970 to 55,542 by 1980. The civilian labor force increased from 55,542 to 61,749 between 1980 and 1985, but since that time, the county's labor force has declined to 59,518.

In 1970, the unemployment rate in Musselshell County was 7.4 percent (Table 3.4). With the increased oil and gas activity in the late 1970s, the unemployment rate for the county declined to 2.3 percent by 1980. Since 1980, however, the unemployment rate has steadily increased and has been consistently near or over 10 percent since 1986. In Yellowstone County, the unemployment rate has remained at or near 7 percent, except in 1980 when oil and gas activity was high and unemployment decreased to below 5 percent.

The occupational groups listed in Table 3.5 are applicants registered at the Billings Job Service Office that could be trained to work in jobs related to construction and operation of an underground coal mine such as the proposed Bull Mountains mine. Laborers account for the largest group, whereas mechanics represent the smallest group of registered applicants.

Employment Conditions

Employment in the study area, in general, is reflective of the deteriorating economy of eastern Montana since 1980. Major declines in oil and gas exploration employment (42 percent statewide decrease between 1981 and 1986) together with deteriorating farm prices have caused the level of basic industry jobs to decline and have produced few additional secondary jobs. Since 1980, statewide employment has increased only 4.3 percent, with most new jobs occurring in the private sector.

Total employment, as described in Table 3.6 and Table 3.7, for the affected counties includes not only those persons covered by Montana unemployment insurance laws, but also self-employed persons and Federal military persons not covered by unemployment insurance. As such, these employment figures are 10 to 20 percent higher than the employment figures illustrated in Table 3.4.

Total employment in Musselshell County peaked in 1981, when a total of 2,109 persons were employed countywide (Table 3.6). At that time, farm employment was about the same as current levels; however, mining employment (including oil and gas exploration and services) accounted for 342 persons or over three times the employment level reported in 1986. The decline in mining employment in Musselshell County also produced decreases in secondary employment. For example, wholesale trade employment decreased about 53 percent between 1981 and 1986, while employment in the retail trade sector declined approximately 5 percent during the same period.

Billings, the largest city in Montana, is located in south-central Yellowstone County about 35 miles south of the proposed land exchange area, and dominates the industrial makeup of the employment distribution in Yellowstone County. Since 1980, employment in nearly all industrial sectors in Yellowstone

TABLE 3.4

RESIDENT CIVILIAN LABOR FORCE — STATE OF MONTANA, MUSSELSHELL COUNTY, AND YELLOWSTONE COUNTY

Location/Category	*1970*	*1980*	*1985*	*1986*	*1987*	*1988*
Montana						
Civilian Labor Force	273,000	370,000	405,000	407,000	403,000	402,000
Employed Persons	261,000	347,000	374,000	374,000	373,000	374,000
Unemployed Persons	12,000	23,000	31,000	33,000	30,000	28,000
Unemployment Rate	4.4%	6.2%	7.7%	8.1%	7.4%	7.0%
Musselshell County						
Civilian Labor Force	1,440	1,841	1,984	1,961	1,883	1,865
Employed Persons	1,333	1,798	1,838	1,754	1,693	1,695
Unemployed Persons	107	43	146	207	190	170
Unemployment Rate	7.4%	2.3%	7.4%	10.6%	10.1%	9.1%
Yellowstone County						
Civilian Labor Force	35,170	55,542	61,749	61,423	60,043	59,518
Employed Persons	32,966	52,861	57,259	56,718	55,726	55,648
Unemployed Persons	2,204	2,681	4,490	4,705	4,317	3,870
Unemployment Rate	6.3%	4.8%	7.3%	7.7%	7.2%	6.5%

Notes: (1) Employed persons listed in this table are only those employees covered under the Montana unemployment insurance laws who earned wages during the year.

(2) Data for 1988 are based upon 12 month moving average through August 1988.

Source: Montana Department of Labor and Industry, Research and Analysis Bureau, Helena, Montana. November 1988.

TABLE 3.5

JOB APPLICANTS — BILLINGS JOB SERVICE OFFICE

Occupation Category	*Applicants (February 20, 1989)*
Administrative	438
Equipment Operators	196
Truck Drivers	422
Technicians (Mine-related)	528
Mechanics	177
Laborers	1,533

Note: The administrative category includes secretarial, administrative clerk, accountants, and accounting clerks. Equipment operators include heavy equipment operators and log tractor operators. Truck drivers include tractor/trailer drivers, truck drivers (heavy), and truck drivers (light). Technicians (mine-related) include pipe fitters, plumbers, electrician/linemen, ironworkers, boilermakers, welders, sheet metal workers, carpenters, millwrights, cement finishers, and brick layers. Mechanics include auto mechanics, diesel mechanics, and small engine mechanics. Laborers include laborers (construction), laborers (store), fallers, loggers, and sawmill workers.

Source: Gary Lythgoe, Montana Job Service, Billings, Montana, Personal Communication, March 1, 1989.

County has remained stable (Table 3.7). The possible exception to this no-growth situation is the mining sector (including oil and gas services and exploration) which experienced an employment decrease from a peak of 1,090 persons in 1981 to 842 persons by 1986. Employment in the services sector increased from 15,292 in 1981 to 18,794 by 1986, while employment in the wholesale trade sector decreased by approximately 12 percent since 1981.

Baseline Employment Projections

Baseline employment projections for Musselshell and Yellowstone counties were developed by the National Planning Association (NPA) Data Services, Inc., Washington, D.C. (Appendix 7 describes in detail the methodology used by NPA to develop the projections).

Total employment in Musselshell County is projected to show little growth between 1990 and 2010 (Table 3.8). Farm employment is expected to decline from 350 in 1986 to 250 by 2010. Mining employment, which decreased from a high of 342 persons in 1981 to 106 persons by 1986, is expected to continue to decrease to 80 persons by 1990 and to 40 persons by 2010. Most of the remaining industrial sectors in Musselshell County are expected to remain at about the same level through 2010. Some growth is expected in the retail trade, government, and services sectors. The growth associated with the services sector is a continuation of the demand for additional services. Similar growth occurred between 1970 and 1986, when total employment (excluding the services sector) grew 10 percent from 1,314 to 1,447 people and the services sector grew 79 percent from 250 to 448 persons (see Table 3.6).

Total employment in Yellowstone County is projected to increase to 93,630 by the year 2010, representing a 32.1 percent increase over the 20-year projection period (Table 3.9). This projected annual growth rate of 1.4 percent is much less than the historical 1970 to 1986 annual employment growth rate of 3.4 percent. Major increases are expected to occur in the services, finance, and retail trade sectors, whereas employment is projected to decline in the mining, manufacturing, and farming sectors.

TABLE 3.6

EMPLOYMENT IN MUSSELSHELL COUNTY, BY INDUSTRY, 1970 AND 1980 to 1986

Industry	*1970*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*
Total Employment	1,564	1,944	2,109	2,047	1,950	1,931	1,936	1,895
Farm	350	332	347	353	363	353	346	350
Non-farm	1,214	1,612	1,762	1,694	1,587	1,578	1,590	1,545
Private	997	1,349	1,454	1,389	1,299	1,289	1,307	1,264
Agriculture, Forestry, and Fisheries	36	31	30	37	36	31	32	32
Mining	192	278	342	282	195	154	143	106
Construction	49	75	65	92	88	94	94	96
Manufacturing	50	69	70	67	80	87	93	75
Transportation, Communications, and Public Utilities	48	92	99	76	70	65	69	72
Wholesale Trade	49	86	104	69	63	61	67	49
Retail Trade	260	331	334	334	328	335	318	316
Finance, Insurance, and Real Estate	63	74	76	72	71	73	73	70
Services	250	313	334	360	368	389	418	448
Government	217	263	308	305	288	289	283	281
Federal (civilian)	13	19	21	20	20	23	21	20
Federal (military)	28	26	21	21	24	26	25	27
State and Local	176	218	266	264	244	240	237	234

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1988.

TABLE 3.7

EMPLOYMENT IN YELLOWSTONE COUNTY, BY INDUSTRY, 1970 AND 1980 to 1986

Industry	*1970*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*
Total Employment	38,796	60,286	61,650	62,562	63,859	66,607	66,314	66,459
Farm	1,413	1,378	1,392	1,377	1,424	1,389	1,365	1,377
Non-farm	37,383	58,908	60,258	61,185	62,435	65,218	64,949	65,082
Private	31,079	51,017	52,509	53,367	54,391	56,857	56,973	56,780
Agriculture, Forestry, and Fisheries	231	445	503	498	552	583	517	514
Mining	523	783	1,090	1,088	1,030	1,184	976	842
Construction	2,195	3,523	3,433	3,679	4,129	4,343	4,362	4,175
Manufacturing	3,519	4,454	4,368	4,201	4,150	3,656	3,440	3,471
Transportation, Communications, and Public Utilities	3,191	4,865	4,829	4,820	4,686	5,015	5,104	4,967
Wholesale Trade	3,366	5,827	5,984	5,763	5,860	6,064	5,910	5,233
Retail Trade	7,370	12,231	12,190	12,635	12,625	13,222	13,048	13,056
Finance, Insurance, and Real Estate	2,468	4,414	4,820	4,780	4,972	5,294	5,546	5,728
Services	8,216	14,475	15,292	15,903	16,387	17,496	18,070	18,794
Government	6,304	7,891	7,749	7,818	8,044	8,361	7,976	8,302
Federal (civilian)	1,346	1,636	1,686	1,646	1,645	1,669	1,680	1,715
Federal (military)	732	679	538	535	631	660	658	708
State and Local	4,226	5,576	5,525	5,637	5,768	6,032	5,638	5,879

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1988.

TABLE 3.8

ACTUAL AND PROJECTED EMPLOYMENT FOR MUSSELSHELL COUNTY, BY INDUSTRY

Industry	Actual	Projected			
	1986	1990	1995	2000	2005	2010
Total Employment	1,895	1,880	1,890	1,930	1,970	1,990
Farm	350	330	300	280	260	250
Non-farm	1,545	1,550	1,590	1,650	1,700	1,740
Private	1,264	1,250	1,290	1,340	1,380	1,410
Agriculture, Forestry, and Fisheries	32	30	30	30	30	30
Mining	106	80	60	50	40	40
Construction	96	110	110	120	120	130
Manufacturing	75	80	80	90	80	80
Transportation, Communications, & Public Utilities	72	70	70	70	70	70
Wholesale Trade	49	40	40	40	40	30
Retail Trade	316	310	320	340	350	350
Finance, Insurance, & Real Estate	70	60	60	60	60	60
Services	448	470	500	540	580	620
Government	281	290	300	310	320	330
Federal (civilian)	20	20	20	30	30	30
Federal (military)	27	30	30	30	30	30
State and Local	234	240	250	260	270	270

Note: Data may not add to totals due to rounding.

Source: National Planning Association Data Services, Inc., Washington, D.C., February 1989.

TABLE 3.9

ACTUAL AND PROJECTED EMPLOYMENT FOR YELLOWSTONE COUNTY, BY INDUSTRY

Industry	Actual	Projected			
	1986	1990	1995	2000	2005	2010
Total Employment	66,459	70,860	77,840	84,240	89,750	93,630
Farm	1,377	1,300	1,190	1,110	1,040	960
Non-farm	65,082	69,550	76,650	83,130	88,710	92,670
Private	56,780	60,900	67,680	73,770	79,040	82,760
Agriculture, Forestry, and Fisheries	514	570	620	670	710	720
Mining	842	800	760	760	750	730
Construction	4,175	4,580	4,960	5,150	5,320	5,400
Manufacturing	3,471	3,420	3,300	3,190	3,050	2,860
Transportation, Communications, & Public Utilities	4,967	5,310	5,560	5,750	5,800	5,700
Wholesale Trade	5,233	5,520	5,940	6,250	6,460	6,510
Retail Trade	13,056	14,030	15,750	17,240	18,310	18,820
Finance, Insurance, & Real Estate	5,728	6,070	6,650	7,120	7,440	7,560
Services	18,794	20,610	24,150	27,650	31,210	34,470
Government	8,302	8,650	8,970	9,370	9,670	9,910
Federal (civilian)	1,715	1,810	1,930	2,040	2,140	2,230
Federal (military)	708	720	720	720	720	720
State and Local	5,879	6,120	6,320	6,610	6,820	6,960

Note: Data may not add to totals due to rounding.

Source: National Planning Association Data Services, Inc., Washington, D.C., February 1989.

Income

Income Characteristics

In 1987, the average wages paid for all workers in Musselshell County was $242 per week (Table 3.10), or approximately 24 percent lower than the average wages for all workers in Montana. Within industry groups, the average wage in Musselshell County is less than the state average for corresponding groups, except for wages paid in the agricultural services sector. Since there are only 12 employees in the agricultural services sector, the higher wages have little impact on the county average. Federal government jobs pay the highest wages in Musselshell County followed by agricultural services and transportation jobs. The lowest paying jobs in Musselshell County are in the services and retail trade industries. Services sector jobs in Musselshell County pay 60.9 percent of the state average for services sector jobs.

The average wages paid in Yellowstone County are higher than the statewide average and higher than nearly all jobs in Musselshell County (agricultural services jobs being the exception). The only industry in Yellowstone County that pays less than the state average is state government, which pays 94.1 percent of the state average for state government jobs (Table 3.10). The highest paying jobs in Yellowstone County are in the mining sector (including oil and gas exploration and services) which pay an average of $596 per week. Jobs in the mining sector also pay approximately 75 percent more than the average county job. Similar to Musselshell County and the state, the lowest paying jobs in Yellowstone County are in the agricultural services and the retail trade industries.

In 1970, per capita income for Musselshell County was $3,429, or about 85 percent of the United States average and 97 percent of the state per capita income (Table 3.11). By 1980, with the increased oil and gas economic activity, per capita income in Musselshell County had increased to $9,454, and had proportionally increased to 95 percent of the United States average income and 106 percent of the state average. However, by 1986, the per capita income in Musselshell County has declined to 74 percent of the United States average and 92 percent of the state average.

Until recent years, the per capita income in Yellowstone County has been near the United States average and consistently higher than the state average (Table 3.11). However, by 1986, the per capita income of Yellowstone County was $13,019, or 89 percent of the United States average.

TABLE 3.10

AVERAGE WEEKLY WAGES — MONTANA, MUSSELSHELL COUNTY, AND YELLOWSTONE COUNTY, 1987

Industry Group	*Montana Average Weekly Wage*	*Average Weekly Wage*	*Percent of State*	*Percent of County Average*
Musselshell County				
All Industries	$316	$242	76.6%	100.0%
Federal Government	470	465	98.9%	192.2%
Agricultural Services	232	424	182.8%	175.2%
Transportation	445	387	87.0%	159.9%
State Government	387	367	94.8%	151.7%
Mining	561	358	63.8%	147.9%
Wholesale Trade	381	352	92.4%	145.5%
Finance, Insurance, & Real Estate	354	308	87.0%	127.3%
Construction	396	273	68.9%	112.8%
Local Government	324	261	80.6%	107.9%
Manufacturing	414	205	49.5%	84.7%
Services	266	162	60.9%	66.9%
Retail Trade	182	153	84.1%	63.2%
Yellowstone County				
All Industries	$316	$341	107.9%	100.0%
Federal Government	470	542	115.3%	158.9%
Agricultural Services	232	233	100.4%	68.3%
Transportation	445	451	101.4%	132.3%
State Government	387	364	94.1%	106.7%
Mining	561	596	106.2%	174.8%
Wholesale Trade	381	432	113.4%	126.7%
Finance, Insurance, & Real Estate	354	388	109.6%	113.8%
Construction	396	422	106.6%	123.8%
Local Government	324	348	107.4%	102.1%
Manufacturing	414	437	105.6%	128.2%
Services	266	328	123.3%	96.2%
Retail Trade	182	195	107.1%	57.2%

Source: Montana Department of Labor and Industry, Research and Analysis Bureau, Helena, Montana, 1987.

TABLE 3.11

PER CAPITA INCOME — UNITED STATES, MONTANA, MUSSELSHELL COUNTY, AND YELLOWSTONE COUNTY, SELECTED YEARS 1970 AND 1980 to 1986

			Musselshell County			*Yellowstone County*		
Year	*United States*	*Montana*	*Amount*	*Percent of United States*	*Percent of Montana*	*Amount*	*Percent of United States*	*Percent of Montana*
1970	$ 4,051	$ 3,528	$ 3,429	84.7%	97.2%	$ 3,624	89.5%	102.7%
1980	9,919	8,924	9,454	95.3%	105.9%	10,198	102.8%	114.3%
1981	10,949	9,874	10,573	96.6%	107.1%	11,110	101.5%	112.5%
1982	11,480	10,084	10,347	90.1%	102.6%	11,719	102.1%	116.2%
1983	12,098	10,424	10,040	83.0%	96.3%	12,085	99.9%	115.9%
1984	13,114	10,836	9,901	75.5%	91.4%	12,584	96.0%	116.1%
1985	13,895	11,021	9,933	71.5%	90.1%	12,735	91.7%	115.6%
1986	14,606	11,726	10,827	74.1%	92.3%	13,019	89.1%	111.0%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1988.

Income Conditions

Total current earnings in Musselshell County increased at an annual rate of 9.1 percent between 1970 and 1980 (Table 3.12). Since 1980, however, total earnings have changed very little, declining from a high of $26.9 million in 1981 to $24.2 million by 1986. The most significant decline in earnings occurred in the mining industry, decreasing 71 percent from a high of $8.0 million in 1981 to $2.3 million by 1986. The wholesale trade industry also experienced a 53.8 percent decline in earnings ($2.3 million in 1981 to $1.1 million by 1986), while earnings in the transportation industry decreased 7.1 percent. Earnings in the services sector and government have shown the largest increases between 1980 and 1986.

Major sources for earnings in Musselshell County are, in order of importance, the services sector, the government sector, the retail trade sector, the mining industry (including oil and gas exploration and services), and the transportation and utilities sector. Government earnings totalled $4.2 million in 1986, comprising 17.5 percent of total earnings. Farm earnings rebounded from a net loss in 1985 of $186,000 to a high of $3.8 million by 1986 (Table 3.12).

TABLE 3.12

EARNINGS BY MAJOR SOURCE, MUSSELSHELL COUNTY, 1970 AND 1980 to 1986 (In Current Dollars)

Industry	*1970*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*
Total Earnings	$8,981	$23,470	$26,882	$24,306	$22,671	$21,861	$21,463	$24,204
Farm	1,817	1,723	2,589	1,143	431	364	(186)	3,771
Non-farm	7,164	21,747	24,293	23,163	22,240	21,497	21,649	20,433
Private	6,281	19,146	21,246	19,787	18,551	17,473	17,450	16,188
Agriculture, Forestry, & Fisheries	169	252	242	267	492	411	374	516
Mining	1,621	6,468	7,971	7,551	5,392	3,594	3,224	2,287
Construction	269	1,088	888	986	1,111	1,187	1,305	1,334
Manufacturing	153	331	345	352	571	781	812	525
Transportation, Communications, & Public Utilities	677	2,055	2,327	2,251	2,074	2,324	2,288	2,161
Wholesale Trade	547	2,175	2,344	1,403	1,248	1,234	1,441	1,084
Retail Trade	1,140	2,462	2,644	2,781	3,065	3,024	2,846	2,855
Finance, Insurance, & Real Estate	295	916	942	896	971	959	968	990
Services	1,410	3,399	3,543	3,300	3,627	3,959	4,192	4,436
Government	883	2,601	3,047	3,376	3,689	4,024	4,199	4,245
Federal (civilian)	102	304	417	428	461	528	517	512
Federal (military)	31	76	74	83	109	122	129	149
State and Local	750	2,221	2,556	2,865	3,119	3,374	3,553	3,584

Note: Data may not add to totals due to rounding.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1988.

Total current earnings in Yellowstone County increased at an annual rate of 11 percent between 1970 and 1980 (Table 3.13), but since 1980, earnings have grown at a much smaller rate of 4 percent. In fact, between 1983 and 1986, total earnings in Yellowstone County grew only 8 percent — less than the 1970-80 annual growth rate. Earnings in Yellowstone County are dominated by the services sector which comprised over 24 percent of all earnings in the county in 1986. Government earnings usually make up approximately 13 percent of all earnings, while farm earnings typically account for about 1 percent of total earnings.

Baseline Income Projections

Earnings for Musselshell and Yellowstone counties were projected by NPA Data Services, Inc.(see Appendix 7 for methodology). Total earnings (1982 dollars) for Musselshell County are projected to grow at an annual rate of 2.6 percent between 1990 and 2010 (Table 3.14). This growth is attributable to increased productivity and is slightly less than the 1970 to 1980 growth rates of 3.1 percent for earnings (1982 dollars). Most of the growth is projected to occur in the private sector. Specifically, the services industry, which is one of the few sectors with a

TABLE 3.13

EARNINGS BY MAJOR SOURCE, YELLOWSTONE COUNTY, 1970 AND 1980 to 1986 (In Current Dollars)

Industry	*1970*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*
Total Earnings	$271,790	$862,410	$928,513	$994,033	$1,056,145	$1,118,312	$1,135,086	$1,140,455
Farm	13,752	6,962	2,113	2,888	4,210	5,354	4,248	13,990
Non-farm	258,038	855,448	926,400	991,145	1,051,935	1,112,958	1,130,838	1,126,465
Private	219,456	751,603	813,498	868,688	918,108	970,104	985,410	970,664
Agriculture, Forestry, & Fisheries	1,333	4,325	4,926	5,446	6,494	6,187	4,869	4,837
Mining	4,174	16,635	26,836	30,128	29,758	36,241	31,638	26,508
Construction	19,971	74,866	71,635	77,807	86,592	87,968	93,834	90,684
Manufacturing	33,048	93,343	104,779	106,418	105,575	99,516	95,580	97,023
Transportation, Communications, & Public Utilities	30,453	106,192	116,949	126,753	128,256	138,477	139,517	135,006
Wholesale Trade	28,715	114,295	125,643	127,028	132,617	143,148	141,059	128,424
Retail Trade	38,761	116,029	121,940	131,407	139,889	145,765	145,545	143,614
Finance, Insurance, & Real Estate	13,272	42,852	47,229	48,427	54,549	57,090	61,642	65,964
Services	49,729	183,066	193,561	215,274	234,378	255,712	271,726	278,604
Government	38,582	103,845	112,902	122,457	133,827	142,854	145,428	155,801
Federal (civilian)	13,487	33,570	37,989	39,526	42,773	45,412	48,106	48,016
Federal (military)	1,186	2,255	2,166	2,556	3,155	3,418	3,487	3,979
State and Local	23,909	68,020	72,747	80,375	87,899	94,024	93,835	103,806

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1988.

TABLE 3.14

EARNINGS IN MUSSELSHELL COUNTY, BY INDUSTRY, 1990 TO 2010 (Thousands of 1982 Dollars)

Industry	*1990*	*1995*	*2000*	*2005*	*2010*
Total Earnings	$23,690	$26,840	$30,670	$34,910	$39,940
Farm	4,200	4,440	4,560	4,730	4,940
Non-farm	19,490	22,400	26,110	30,180	35,000
Private	15,520	17,960	21,130	24,630	28,930
Agriculture, Forestry, and Fisheries	460	490	550	590	650
Mining	1,650	1,470	1,460	1,500	1,600
Construction	1,370	1,800	2,270	2,810	3,420
Manufacturing	590	920	1,320	1,730	2,140
Transportation, Communications, & Public Utilities	1,990	2,180	2,400	2,610	2,830
Wholesale Trade	880	910	980	1,040	1,160
Retail Trade	2,810	3,310	3,910	4,570	5,290
Finance, Insurance, & Real Estate	910	1,030	1,160	1,320	1,490
Services	4,870	5,840	7,080	8,470	10,350
Government	3,970	4,450	4,980	5,550	6,070
Federal (civilian)	500	560	620	690	730
Federal (military)	150	180	210	240	280
State and Local	3,320	3,710	4,150	4,620	5,060

Note: Data may not add to totals due to rounding.

Source: National Planning Association Data Services, Inc., Washington, D.C., February 1989.

projected increase in employment, is expected to increase from $4.8 million in 1990 to $10.4 million by 2010. Government earnings are projected to increase 53 percent over the projection period, while farm earnings are expected to increase marginally from $4.2 million in 1990 to $4.9 million by year 2010.

In Yellowstone County, earnings are expected to nearly double over the 20 year projection period, increasing from $1.16 billion in 1990 to $2.04 billion by year 2010 (Table 3.15). Major increases in earnings are expected to occur in the services sector and, to a lesser extent, in the retail trade and public utilities sectors. Government earnings are projected to increase 41 percent over the projection period, whereas farm earnings are expected to increase 20 percent over the 20 year period.

Fiscal Conditions

The following sections describe the fiscal conditions of Musselshell County, the municipality of Roundup, the elementary and high school districts in Roundup, Yellowstone County, and the city of Billings. Fiscal conditions for each local governmental unit are presented in terms of public service funding and expenditures.

In Montana, the most important component of public service funding for local governmental units is property taxation. Depending upon the class of property and its taxable valuation, local governments have the flexibility to set revenues by attaching mill levies for specified purposes. They are limited, however, by current law to not raise more funding than prior years if no growth has occurred. Other sources of revenue for local governments include licenses and permits, intergovernmental transfers from State and Federal governments, fines and forfeitures, charges for services, and other miscellaneous sources.

Counties

Table 3.16 lists the taxable valuation, mill levies, revenues, and expenditures for Musselshell County for fiscal year (FY) 1982 and FY 1987. The taxable valuation in Musselshell County has changed very little over the five year period; however, mill levies have increased over 50 percent. Musselshell County general fund revenues from property taxes increased 61.2 percent from $365,644 to $589,514 between 1982 and 1987, while general fund revenues from other sources increased 24 percent.

Total taxable valuation in Yellowstone County decreased from $227.7 million in FY 1987 to $210.5 million by FY 1988, representing a decrease of 7.6 percent in one year (Table 3.17). Most of this decline was attributable to decreasing values on land and improvements and reduced valuation on centrally assessed utilities. In FY 1988, land and improvements comprised about 63 percent of all taxable valuation followed by centrally assessed utilities (19 percent) and personal property (18 percent). Mill levies in Yellowstone County have increased from 69.3 mills in FY 1986 to 74.14 mills by FY 1988. General fund mills usually total about 30 percent of all levies, while mills for welfare (poor fund) usually average about 14 percent of all county levies.

Total revenues for Yellowstone County increased from about $22 million in FY 1986 to $22.7 million by FY 1988 (Table 3.17). Approximately 60 percent of all revenues are raised through property taxes and about 15 percent are obtained through intergovernmental transfers. Total expenditures for Yellowstone County decreased from $26.4 million in FY 1986 to $20.6 million by FY 1988. During this time period, expenditures for general government declined by over $450,000. General fund revenues and expenditures both increased from FY 1986 to FY 1988. In terms of real per capita expenditures, costs for general fund spending have remained about the same.

TABLE 3.15

EARNINGS IN YELLOWSTONE COUNTY, BY INDUSTRY, 1990 TO 2010 (Thousands of 1982 Dollars)

Industry	*1990*	*1995*	*2000*	*2005*	*2010*
Total Earnings	$1,159,820	$1,402,370	$1,671,530	$1,970,130	$2,305,650
Farm	15,700	16,730	17,310	18,060	18,930
Non-farm	1,144,120	1,385,640	1,654,220	1,952,070	2,286,720
Private	999,850	1,227,120	1,480,870	1,763,380	2,083,260
Agriculture, Forestry, & Fisheries	4,950	6,220	7,900	9,630	11,440
Mining	24,090	25,370	27,930	30,770	33,780
Construction	90,300	109,650	127,850	148,450	171,910
Manufacturing	86,750	92,270	98,180	103,670	108,920
Transportation, Communications, & Public Utilities	133,480	156,080	179,650	202,420	224,930
Wholesale Trade	124,920	150,080	176,240	203,140	231,120
Retail Trade	152,180	188,080	227,330	267,400	309,080
Finance, Insurance, & Real Estate	69,870	91,020	114,820	140,620	168,640
Services	313,310	408,360	520,970	657,270	823,440
Government	144,260	158,520	173,360	188,690	203,460
Federal (civilian)	44,710	48,590	52,130	55,500	58,850
Federal (military)	4,040	4,790	5,610	6,480	7,380
State and Local	95,510	105,140	115,610	126,710	137,230

Note: Data may not add to totals due to rounding.

Source: National Planning Association Data Services, Inc., Washington, D.C., February 1989.

TABLE 3.16

LOCAL GOVERNMENT FINANCES — MUSSELSHELL COUNTY

Category	*1981-82*	*1986-87*	*Percent Change*
Taxable Valuation ($000)	$24,029	$23,788	-1.0%
Mill Levy	30.47	48.28	58.5%
General Fund Revenues			
Property	$365,644	$589,514	61.2%
Other	406,912	504,388	24.0%
General Fund Expenditures			
General Government	$283,334	$715,832	152.7%
Other	315,161	464,943	47.5%
Per Capita General Fund Expenditures	$136	$256	88.2%

Note: Only limited fiscal data are available for Musselshell County.

Source: Data compiled from Montana Department of Commerce, Local Government Services Division, Helena, Montana, Annual Financial Reports.

Municipalities

The taxable valuation for Roundup declined from $1.7 million in FY 1986 to $1.5 million by FY 1988 (Table 3.18). The taxable valuation on land and improvements during this same time period declined by over $100,000, while personal property valuation decreased by $78,000. Mill levies also decreased between FY 1986 and FY 1988, representing an effort to tighten the budget of Roundup. General fund revenues and expenditures both decreased between FY 1986 and FY 1988. On a per capita basis, the decrease in expenditures was slight, declining from $89 per person in FY 1986 to $82 per person by FY 1988.

The taxable valuation for Billings declined 7 percent from FY 1986 to FY 1988 (Table 3.19). Land and improvements, which usually comprise about 80 percent of total taxable valuation, decreased from $104.5 million in FY 1986 to $98.2 million by FY 1988. Total mill levies remained constant over the period, while mills for general fund purposes increased marginally from 66.27 to 68.57 mills. Although total revenues for Billings decreased between FY 1986 and FY 1988, general fund revenues remained fairly constant. Total expenditures were $40.8 million in FY 1986, $45.2 million in FY 1987, and $40.1 million in FY 1988.

TABLE 3.17

LOCAL GOVERNMENT FINANCES — YELLOWSTONE COUNTY

	1985/86		*1986/87*		*1987/88*	
Category	*Amount*	*Percent*	*Amount*	*Percent*	*Amount*	*Percent*
Taxable Valuation ($000)	$223,301.9	100.0%	$227,726.8	100.0%	$210,534.5	100.0%
Land & Improvements	141,348.5	63.3%	140,170.9	61.6%	132,714.6	63.0%
Centrally Assessed Property	45,787.4	20.5%	47,909.7	21.0%	40,514.3	19.2%
Personal Property	36,166.0	16.2%	39,646.2	17.4%	37,305.6	17.7%
Mill Levies	69.30	100.0%	72.18	100.0%	74.14	100.0%
General Fund	19.90	28.7%	18.80	26.0%	22.10	29.8%
Poor	9.00	13.0%	11.10	15.4%	10.60	14.3%
Other	40.40	58.3%	42.28	58.6%	41.44	55.9%
All Revenues	$21,989,913	100.0%	$21,285,301	100.0%	$22,714,567	100.0%
Property Taxes	10,889,036	49.5%	11,171,843	52.5%	14,053,527	61.9%
Transfers	3,784,190	17.2%	4,081,780	19.2%	3,228,810	14.2%
Other	7,316,687	33.3%	6,031,678	28.3%	5,432,230	23.9%
All Expenditures	$26,399,685	100.0%	$23,725,651	100.0%	$20,579,494	100.0%
General Government	5,176,939	19.6%	4,881,260	20.6%	4,719,932	22.9%
Public Safety	2,970,308	11.3%	3,147,309	13.3%	4,366,142	21.2%
Public Works	3,264,893	12.4%	2,675,968	11.3%	2,682,949	13.0%
Public Health	2,249,915	8.5%	2,079,444	8.8%	2,000,208	9.7%
Other	12,737,630	48.2%	10,941,670	46.1%	6,810,263	33.1%
Population	120,600		120,000		118,000	
Real Per Capita Expenditures	$219		$198		$174	
General Fund Statistics						
Revenues	$ 7,342,726		$ 6,317,316		$ 7,677,446	
Expenditures	6,561,300		6,386,700		6,959,632	
Per Capita Expenditures	54		53		59	
Expenditures (1987 Dollars)	6,933,028		6,577,014		6,959,632	
Per Capita Expenditures (1987 Dollars)	61		56		59	

Sources: (1) Montana Tax Foundation, Inc., Helena, Montana.
(2) Montana Department of Commerce, Local Government Services Division, Helena, Montana.

TABLE 3.18

LOCAL GOVERNMENT FINANCES — ROUNDUP

Category	1985/86		1986/87		1987/88	
	Amount	*Percent*	*Amount*	*Percent*	*Amount*	*Percent*
Taxable Valuation ($000)	$1,726.9	100.0%	$1,687.1	100.0%	$1,543.2	100.0%
Land & Improvements	1,267.7	73.4%	1,250.6	74.1%	1,159.9	75.2%
Centrally Assessed Property	214.9	12.4%	226.9	13.4%	217.1	14.1%
Personal Property	244.3	14.1%	209.6	12.4%	166.2	10.8%
Mill Levies	75.00	100.0%	66.00	100.0%	66.00	100.0%
General Fund	65.00	86.7%	59.00	89.4%	56.00	84.8%
Streets	.00	.0%	.00	.0%	.00	.0%
Other	10.00	13.3%	7.00	10.6%	10.00	15.2%
All Revenues	$425,918	100.0%	$553,686	100.0%	$582,414	100.0%
Property Taxes	198,716	46.7%	272,325	49.2%	197,782	34.0%
Transfers	110,219	25.9%	136,827	24.7%	135,926	23.3%
Other	116,983	27.5%	144,534	26.1%	248,706	42.7%
All Expenditures	$327,619	100.0%	$593,503	100.0%	$609,724	100.0%
General Government	49,136	15.0%	80,773	13.6%	89,879	14.7%
Public Safety	90,776	27.7%	200,466	33.8%	205,656	33.7%
Public Works	96,528	29.5%	264,831	44.6%	268,213	44.0%
Other	91,179	27.8%	47,433	8.0%	45,976	7.5%
Population	2,450		2,580		2,400	
General Fund Revenues	$243,392	57.1%	$190,216	34.4%	$199,583	34.3%
General Fund Expenditures	$217,510	66.4%	$213,125	35.9%	$196,595	32.2%
Per Capita						
Total Expenditures	$134		$230		$254	
General Fund Revenues	99		74		83	
General Fund Expenditures	89		83		82	

Sources: (1) Montana Tax Foundation, Inc., Helena, Montana.
(2) Montana Department of Commerce, Local Government Services Division, Helena, Montana.

General fund expenditures increased somewhat; however, per capita general fund expenditures decreased from $213 per person in FY 1986 to $199 per person by FY 1988.

School Districts

Financial information on school districts in Musselshell County is presented for the elementary and high school districts of Roundup. No financial information is presented for Yellowstone County school districts because only minor impacts are expected for these school districts. The data presented in this section was collected from annual trustee reports submitted to the Montana Office of Public Instruction and from the Montana Tax Foundation, Inc., a private non-profit corporation in Helena, Montana.

Taxable valuation for Roundup Elementary School District has remained stable since FY 1986, and taxable valuation for the high school district has decreased 10.3 percent between 1986 and 1988 (Table 3.20). District mill rates have declined by nearly 50 percent from 58.2 mills in FY 1986 to 33.18 mills by FY 1988. Of the total district levies, approximately 47 percent are for the elementary general fund, 16 percent for transportation, and 33 percent for high school purposes.

Elementary school revenues increased from $1.1 million in school year 1985/86 to $1.5 million by school year 1987/88. In 1987/88, district levies accounted for 13 percent of the budget and county levies for 30 percent. Statewide levies, including the school foundation program, accounted for nearly one-half of all revenues. Total elementary expenditures also have increased since 1986, with general fund expenditures accounting for most of the increase. In 1987/88, debt service totalled less than 1 percent of all expenditures.

Similar to the elementary school district, the high school district revenues have increased by over one-third since 1985/86. In 1987/88, district levies at the high school accounted for 28 percent of total revenues, countywide levies for 21 percent, and state levies and the school foundation program accounted for 44 percent. Total expenditures at the high school also increased between 1985/86 and 1987/88 from $0.8 million to $1.1 million. In 1987/88, general fund expenditures made up about three-fourths of the budget and spending on transportation accounted for about 6 percent. The cost to the high school district for retirement was approximately 10 percent of the budget.

TABLE 3.19

LOCAL GOVERNMENT FINANCES — BILLINGS

Category	1985/86		1986/87		1987/88	
	Amount	*Percent*	*Amount*	*Percent*	*Amount*	*Percent*
Taxable Valuation ($000)	$132,181.9	100.0%	$130,424.6	100.0%	$123,083.3	100.0%
Land & Improvements	104,460.6	79.0%	103,157.4	79.1%	98,227.7	79.8%
Centrally Assessed Property	11,863.1	9.0%	13,039.4	10.0%	11,052.2	9.0%
Personal Property	15,858.2	12.0%	14,227.8	10.9%	13,803.4	11.2%
Mill Levies	81.40	100.0%	81.40	100.0%	81.40	100.0%
General Fund	66.27	81.4%	66.48	81.7%	68.57	84.2%
Streets	.00	.0%	.00	.0%	.00	.0%
Other	15.13	18.6%	14.92	18.3%	12.83	15.8%
All Revenues	$42,858,545	100.0%	$37,591,517	100.0%	$39,799,617	100.0%
Property Taxes	12,881,911	30.1%	12,048,563	32.1%	14,393,919	36.2%
Transfers	5,324,288	12.4%	4,297,527	11.4%	3,829,772	9.6%
Other	24,652,346	57.5%	21,245,427	56.5%	21,575,926	54.2%
All Expenditures	$40,821,489	100.0%	$45,241,463	100.0%	$40,077,625	100.0%
General Government	2,218,251	5.4%	2,331,237	5.2%	2,493,905	6.2%
Public Safety	8,726,681	21.4%	9,011,378	19.9%	9,065,891	22.6%
Public Works	3,708,854	9.1%	3,894,232	8.6%	3,799,547	9.5%
Other	26,167,703	64.1%	30,004,616	66.3%	24,718,282	61.7%
Population	70,500		80,310		80,000	
General Fund Revenues	$16,117,809		$15,094,955		$16,877,574	
General Fund Expenditures	$15,048,140		$15,194,254		$15,915,852	
Per Capita						
Total Expenditures	$579		$563		$501	
General Fund Revenues	229		188		211	
General Fund Expenditures	213		189		199	

Sources: (1) Montana Tax Foundation, Inc., Helena, Montana.
(2) Montana Department of Commerce, Local Government Services Division, Helena, Montana.

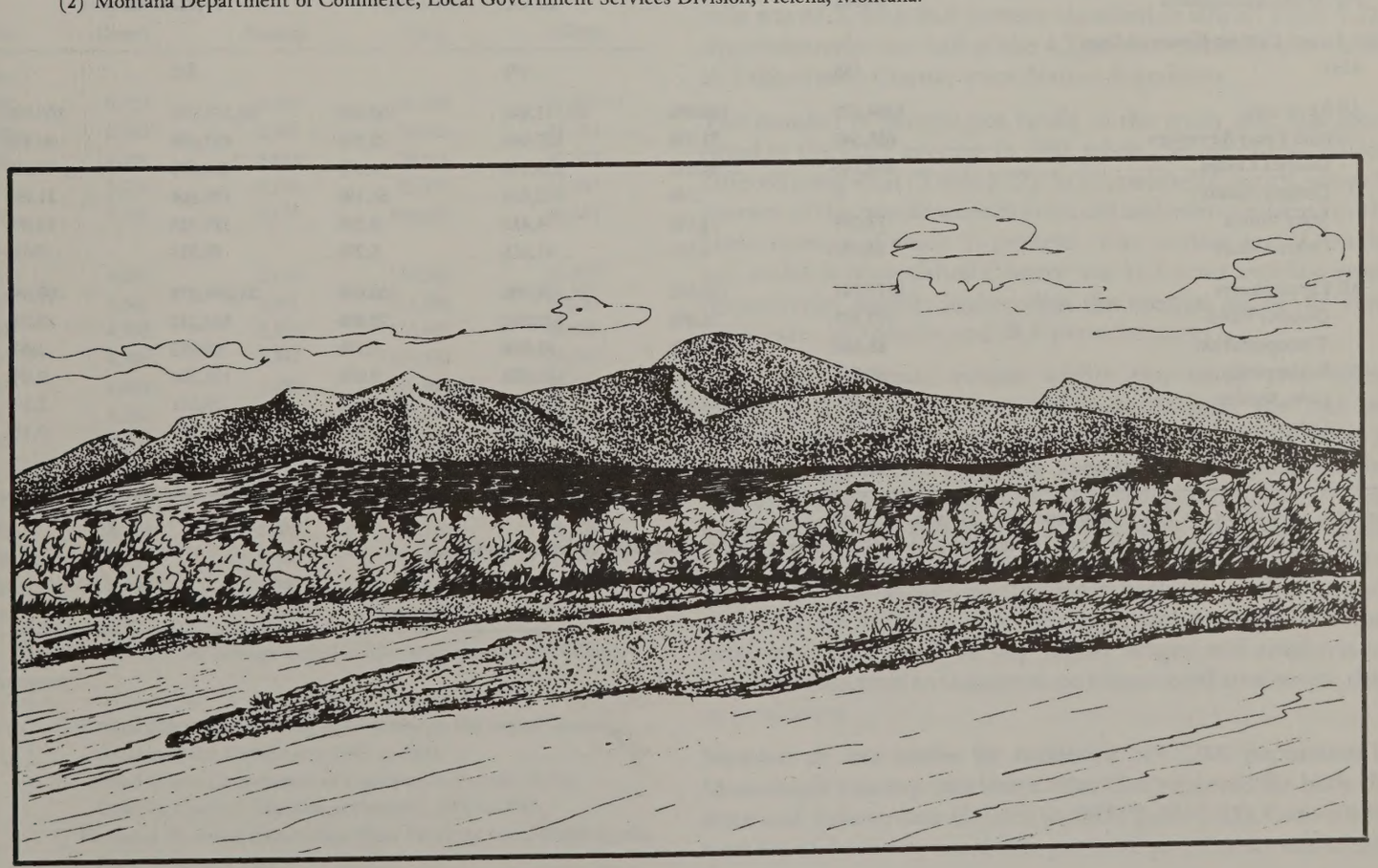


TABLE 3.20

LOCAL GOVERNMENT FINANCES — ROUNDUP SCHOOL DISTRICT

	1985/86		1986/87		1987/88	
Category	*Amount*	*Percent*	*Amount*	*Percent*	*Amount*	*Percent*
Taxable Valuation ($000)						
Elementary District	$11,845.0		$11,253.8		$11,093.4	
High School District	16,280.7		16,180.6		14,606.4	
Mill Levies						
Countywide Levies	49.92	100.0%	55.42	100.0%	56.98	100.0%
High School General	19.44	38.9%	22.18	40.0%	22.82	40.0%
School General	30.48	61.1%	33.24	60.0%	34.16	60.0%
District Levies	58.20	100.0%	41.22	100.0%	33.18	100.0%
General Fund	23.21	39.9%	14.57	35.3%	15.64	47.1%
Transportation	7.62	13.1%	2.19	5.3%	5.24	15.8%
High School	24.74	42.5%	22.05	53.5%	10.89	32.8%
Other	2.63	4.5%	2.41	5.8%	1.41	4.2%
Elementary District Financial Data						
ANB	530		624		478	
All Revenues	$1,122,434	100.0%	$1,477,451	100.0%	$1,528,437	100.0%
General Fund Revenues	737,521	65.7%	1,068,556	72.3%	1,061,988	69.5%
District Levies	631,028	85.6%	158,423	14.8%	142,120	13.4%
County Funds	0	.0%	742,875	69.5%	324,314	30.5%
State Funds	98,957	13.4%	125,893	11.8%	528,100	49.7%
Other Funds	7,536	1.0%	41,365	3.9%	67,454	6.4%
All Expenditures	$1,050,458	100.0%	$1,555,753	100.0%	$1,444,724	100.0%
General Fund	697,476	66.4%	1,116,562	71.8%	1,051,415	72.8%
Transportation	87,949	8.4%	82,397	5.3%	62,803	4.3%
Retirement	82,081	7.8%	138,868	8.9%	136,260	9.4%
Debt Service	17,160	1.6%	14,581	.9%	12,861	.9%
Other	165,792	15.8%	203,345	13.1%	181,385	12.6%
Per ANB Expenditures	$1,982		$2,493		$3,022	
High School District Financial Data						
ANB	186		171		242	
All Revenues	$894,575	100.0%	$1,113,944	100.0%	$1,235,276	100.0%
General Fund Revenues	655,640	73.3%	807,966	72.5%	857,086	69.4%
District Levies	567,145	86.5%	279,390	34.6%	238,775	27.9%
County Funds	0	.0%	412,530	51.1%	179,664	21.0%
State Funds	73,098	11.1%	74,431	9.2%	378,726	44.2%
Other Funds	31,577	4.8%	41,615	5.2%	59,921	7.0%
All Expenditures	$777,741	100.0%	$1,138,906	100.0%	$1,094,278	100.0%
General Fund	577,397	74.2%	829,505	72.8%	823,322	75.2%
Transportation	88,366	11.4%	92,098	8.1%	60,952	5.6%
Retirement	58,218	7.5%	102,070	9.0%	107,266	9.8%
Debt Service	33,470	4.3%	28,872	2.5%	25,501	2.3%
Other	47,089	6.1%	86,361	7.6%	77,237	7.1%
Per ANB Expenditures	$4,181		$6,660		$4,522	

Sources: (1) Montana Tax Foundation, Inc., Helena, Montana.
(2) Montana Department of Commerce, Local Government Services Division, Helena, Montana.

Social Environment

Definition of Social Study Area

The study area encompasses southern Musselshell County (including the community of Roundup) and the northern portion of Yellowstone County (excluding, for the most part, towns and cities). Major emphasis in the description of the social environment has been placed on Musselshell County and Roundup, since the number of people expected to migrate into the area could be easily absorbed into a city the size of Billings. However, due to increased traffic on U.S. Highway 87 and U.S. Highway 312 (Huntley Road) as a result of the project, emergency services in Billings have been addressed.

Demography

The U.S. Bureau of the Census (1980) reported the population of Musselshell County to be 4,428 persons, an increase of 18.6 percent over the 1970 census count of 3,734 (Table 3.21). Most of this increase occurred in the rural part of the county, with the population of Roundup remaining at about the 1970 level. Since 1980, however, the rural population has decreased, while Roundup's population has increased about 13.3 percent.

TABLE 3.21

HISTORICAL AND PROJECTED POPULATION — MUSSELSHELL COUNTY, YELLOWSTONE COUNTY, ROUNDUP, AND BILLINGS

Year	*Musselshell County*	*Roundup*	*Yellowstone County*	*Billings*
Census				
1940	5,717	2,644	41,182	23,261
1950	5,408	2,856	55,875	31,834
1960	4,888	2,842	79,016	52,851
1970	3,734	2,116	83,367	61,581
1980	4,428	2,119	108,035	66,842
Estimates				
1981	4,600	2,150	110,200	67,000
1982	4,600	2,261	113,500	68,787
1983	4,700	2,300	116,400	69,000
1984	4,700	2,342	118,700	69,836
1985	4,800	2,450	120,600	70,500
1986	4,700	2,580	120,000	80,310
1987	4,500	2,400	118,000	80,000
Projections				
1990	4,550	2,550	121,240	81,070
1995	4,670	2,620	128,110	85,670
2000	4,780	2,680	134,200	89,740
2005	4,890	2,740	139,640	93,380
2010	5,000	2,800	144,440	96,590

Note: The 1986 estimate for Billings includes the annexation of the Billings Heights area.

Sources:
1) United States Department of Commerce, Bureau of Census, Census of the Population, 1940 to 1980.
2) United States Department of Commerce, Bureau of the Census, Current Population Reports, 1981 to 1987.
3) National Planning Association Data Services, Inc., Washington, D.C., February 1989.

The population of Yellowstone County increased 29.6 percent from 83,367 in 1970 to 108,035 in 1980. Between 1980 and 1987, the population increased by 10,000 people, or approximately 9 percent (Table 3.21). The city of Billings increased 8.5 percent between 1970 and 1980, and since 1980, the population has increased almost 20 percent.

County population projections were developed by the National Planning Association Data Services, Inc., Washington D.C. from 1990 to year 2010 (see Appendix 7 for methodology). Based on these population projections, Musselshell County is expected to increase in population through the 20 year projection period, reaching 5,000 by year 2010 (Table 3.21). The projections for Musselshell County are indicative of some net out-migration over the projection period since natural increase is usually 20 to 30 persons per year. For example, from 1978 through 1987, there were 689 births and 482 deaths or an expected natural increase of 247 persons or 24.7 persons per year. Yellowstone County is projected to increase in population by about 19 percent during the 20 year period (1990 to 2010), reaching a high of 144,440 people by year 2010 (Table 3.21).

The population projections illustrated in Table 3.21 for Roundup and Billings were developed using 1987 city to county population ratios and applying these ratios to the county projections. Thus, the projected growth rates for Roundup and Billings are similar to the county rates.

The number of persons per square mile in Musselshell County in 1980 was 2.4 compared to the state average of 5.4 (U.S. Department of Commerce, Bureau of the Census, 1980). All of the population of Musselshell County was categorized as rural and over 99 percent of the population was classified as white (Table 3.22). In Yellowstone County, the number of persons per square mile was 41.2, with 95.8 percent classified as white (Table 3.22). Approximately one-half of the 4.2 percent minority population in Yellowstone County were Native Americans.

The number of persons per family in the study area was about equal to the state average in 1980, while the age characteristics differed somewhat (Table 3.22). In Musselshell County, about 17 percent of the people were 65 years old and over compared to the State average of about 12 percent. The median age of females and males in Musselshell County was 33.3 years and 32.0 years, respectively, slightly higher than the median age of the State (29.6 years for females and 28.4 years for males).

Per capita personal income within the study area differs markedly by location. In Yellowstone County, the 1986 per capita personal income was estimated to be $13,019, a figure 10 percent higher than the State average and about 20 percent higher than the Musselshell County average of $10,827. Similarly, educational attainment, measured by percent of population (18 years old and over) completing 12 years of school, was higher in Yellowstone County than in both Musselshell County and the State in 1980. These differences are not unusual in that urbanized areas tend to pay higher wages and employment requirements tend to require more educational attainment than in rural areas.

Number of live births by residence per 1,000 population in Musselshell County was lower than that reported for both the state and Yellowstone County in 1987 (Table 3.23). Conversely, number of deaths by residence per 1,000 population was higher

TABLE 3.22

SELECTED DEMOGRAPHIC CHARACTERISTICS — MONTANA, MUSSELSHELL COUNTY, ROUNDUP, YELLOWSTONE COUNTY, AND BILLINGS

Characteristic	*Montana*	*Musselshell County*	*Roundup*	*Yellowstone County*	*Billings*
Population (1980)	786,690	4,428	2,119	108,035	66,842
Female (1980)	50.1%	49.7%	51.4%	51.0%	51.8%
Under 18 Years	28.6%	28.9%	24.5%	27.9%	24.6%
18 to 64 Years	59.3%	54.2%	51.2%	61.6%	62.8%
65 Years and Over	12.1%	16.9%	24.3%	10.5%	12.6%
Median Age	29.6 Years	33.3 Years	NA	29.1 Years	NA
Male (1980)	49.9%	50.3%	48.6%	49.0%	48.2%
Under 18 Years	30.3%	30.4%	25.5%	30.7%	28.0%
18 to 64 Years	60.3%	55.0%	55.8%	61.6%	63.1%
65 Years and Over	9.4%	14.6%	18.7%	7.7%	8.9%
Median Age	28.4 Years	32.0 Years	NA	28.0 Years	NA
Households (1980)	283,742	1,698	922	39,891	26,253
Persons Per Household	2.70	2.60	2.30	2.66	2.54
Persons Per Family	3.24	3.17	3.51	3.20	3.80
Race (1980)					
White	94.1%	99.3%	99.4%	95.8%	95.4%
Native American	4.7%	0.3%	0.5%	2.1%	2.4%
Other	1.2%	0.4%	0.1%	2.1%	2.2%
Percent Completing 12 Years or More of School (1980)	75.4%	65.9%	NA	77.3%	NA
Median Family Income (1979)	$18,413	$14,094	$15,682	$20,744	$20,989
Families Below Poverty Level (1979)	9.2%	15.1%	8.4%	7.1%	7.3%

NA = Not Available

Sources: 1) Montana Department of Commerce, The Census and Economic Information Center, Helena, Montana, 1985.
2) U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population and Housing.

TABLE 3.23

SELECTED VITAL STATISTICS — MONTANA, MUSSELSHELL COUNTY, AND YELLOWSTONE COUNTY

	State of Montana			*Musselshell County*			*Yellowstone County*		
Characteristics	*1985*	*1986*	*1987*	*1985*	*1986*	*1987*	*1985*	*1986*	*1987*
Live Births by Residence Per 1,000 Population	16.3	15.6	15.1	11.9	8.9	10.4	15.9	15.5	14.5
Deaths[1] by Residence Per 1,000 Population	8.1	8.2	8.2	11.0	8.3	11.6	6.9	6.6	6.4
Marriage Licenses Issued Per 1,000 Population	8.7	8.2	8.1	6.7	5.7	4.9	9.6	8.9	8.2
Marital Dissolutions Granted Per 1,000 Population	5.1	5.2	5.0	4.8	3.0	3.6	5.8	6.0	5.5
Out-of-Wedlock Births by Residence Per 1,000 Population	2.7	2.8	2.9	1.7	0.9	1.6	2.4	2.2	2.3
Induced Abortions by Residence Per 1,000 Population	4.0	4.0	3.9	2.3	1.7	2.0	4.0	3.9	3.9
Two Leading Causes of Death by Residence Per 1,000 Population — Cancer	1.7	1.8	1.9	2.9	2.6	3.8	1.7	1.7	1.7
— Heart Disease	2.7	2.7	2.6	4.6	1.9	4.4	2.2	2.0	2.1

Source: Montana Department of Health and Environmental Sciences, Bureau of Records and Statistics, Helena, Montana, 1986, 1987, and 1988.

[1]Exclusive of fetal deaths.

in Musselshell County relative to both the state and Yellowstone County. The higher death rate may be due to the larger number of elderly people residing within Musselshell County.

Nationwide, the two leading causes of death are cancer and heart disease. In 1987, Musselshell County reported almost twice as many deaths per 1,000 population due to cancer and heart disease as did Montana and Yellowstone County (Table 3.23).

Social Life

BLM has adopted the "Guide to Social Assessment" (Branch, *et al.*,, 1982) to assist in predicting social consequences of coal development in the Powder River Coal Production Region. Since Musselshell County is included in the Powder River Coal Region, social conditions of the study area have been examined using the methodology developed in the Guide.

Social elements of a community are greatly influenced by past events; therefore, to understand the present characteristics of a community's social life, past ethnic, economic, and cultural features were examined. Historical events and social processes of the Roundup area have been discussed as they relate to values and life-styles of the current residents.

The social organization, community resources, and perceived well-being of the population also were assessed to describe the social characteristics of Roundup and the surrounding area. These components form the basis for describing how the proposed project would affect the community and individuals within the community.

The social organization of the community is defined by how people of the community relate to each other based on shared ideas and expectations. Ethnic, political, and religious ties are important factors in determining patterns and forms of social interaction. According to Branch,*et al.* (1982), the following five characteristics of social organization are also important in assessing social change within communities:

(1) Diversity/complexity
(2) Outside ties (extra-local linkages)
(3) Distribution of resources and power
(4) Coordination and cooperation among community members
(5) Patterns of social interaction

Community resources include social services (e.g., hospitals, schools, housing) as well community attitudes and experience developed over time (Branch, *et al.*, 1982). Important determinants of community resources of the area also are based upon:

(1) Previous experience of the community with development (i.e., coal mining and oil and gas activities)
(2) Cultural characteristics of the community
(3) Demographic characteristics of the community
(4) Labor force characteristics of the community
(5) Employment and income characteristics of the community
(6) Facilities, services, and fiscal resources
(7) Organizational and regulatory structure of the community
(8) Leadership characteristics of the community
(9) Residents' attitudes toward development and perceptions of the community

The social well-being of the study area was assessed by examining the rates of behaviors such as crime, divorce, and welfare. Behaviors and attitudes concerning access to community resources or perceived lack of access to resources also are addressed.

Information on current social life conditions in the area was obtained through both quantitative and qualitative research methods. Published and unpublished reports were reviewed and news articles in local newspapers (Roundup Record — Tribune and Bull Sheet) were examined.

Quality of life surveys were conducted with residents in the Roundup and in the Bull Mountains areas. A description of the procedures used in conducting the interviews and the survey instrument are presented in Appendix 8. A total of 140 telephone interviews were completed, and survey results were analyzed and are presented for the following two groups:

(1) Roundup area residents: Interviews were conducted with 99, randomly selected individuals residing in and around Roundup.

(2) Bull Mountains residents: Forty-one people who reside within five miles of the PM Coal Mine were interviewed.

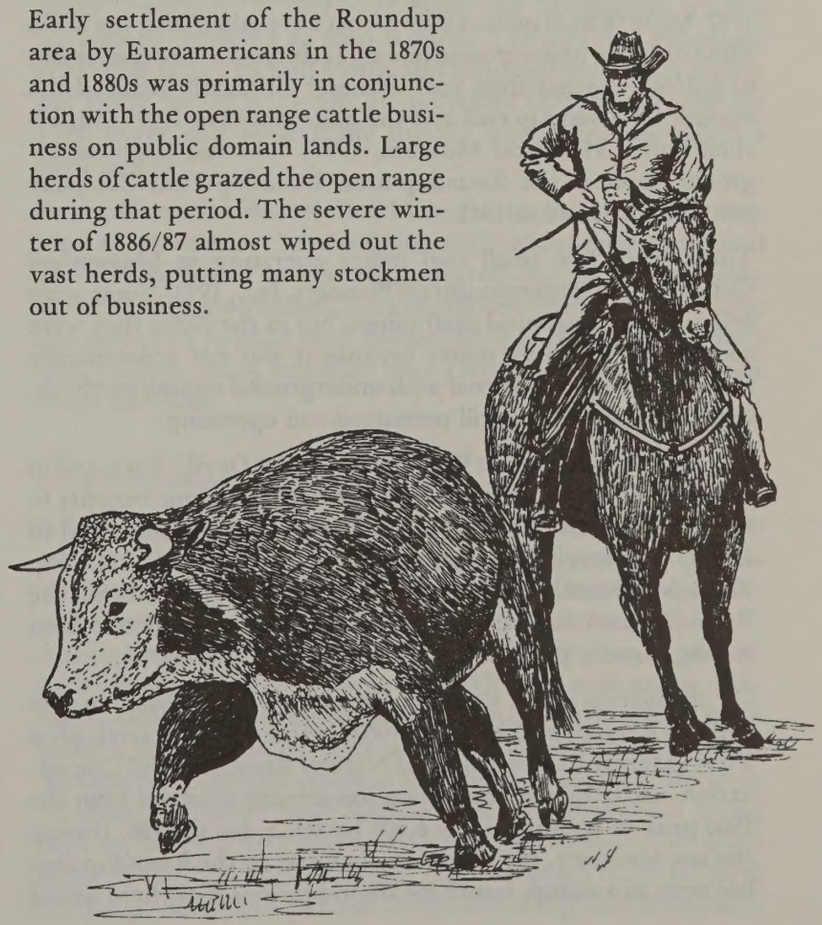
Bull Mountains residents were analyzed separately because they would be the group most likely to experience adverse impacts because of their proximity to the proposed mine. An on-site, unstructured interview was also conducted with a group of three Bull Mountains residents.

In 1979, the Montana Energy and MHD Research and Development Institute, Inc. (MERDI), under contract to the Montana Power Company, conducted a telephone survey of Musselshell residents concerning development of a thermal electric generation facility. Attitudes and opinions of residents concerning growth and development in the area were similar to those obtained in the 1989 quality of life interviews conducted by Economic Consultants Northwest.

History

The social and economic character of Roundup and the surrounding area has evolved in conjunction with the development of the livestock and hydrocarbon industries. Ranching, coal mining, and oil production historically have been the dominant sources of employment and income for Roundup area residents.

Early settlement of the Roundup area by Euroamericans in the 1870s and 1880s was primarily in conjunction with the open range cattle business on public domain lands. Large herds of cattle grazed the open range during that period. The severe winter of 1886/87 almost wiped out the vast herds, putting many stockmen out of business.



Following the rapid expansion and equally precipitous crash of the cattle business in the late 1880s, homesteaders began settling in the Musselshell valley. Land was fenced and dryland farming was initiated by many in-migrants homesteading the land. Generally, dryland farming was unprofitable and most small farms went out-of-business by the 1920s. The widespread failure of farming in the 1920s led to the failure of three banks in Roundup due to defaults on mortgage payments (Roundup Record-Tribune, April 6, 1983). Following the drought years of the early 1930s, most of the land homesteaded in the early 1900s reverted to Musselshell County due to tax delinquency or was acquired by the Federal government under the submarginal lands program (Roundup Record — Tribune, April 6, 1983).

Old Roundup, settled in 1882, started as a stage stop between Roundup and Billings and consisted of a store, saloon, and post office which provided goods and services to local stockmen. The advent of coal mining in 1908 and the completion of the railroad in 1909 greatly expanded the population of Roundup and the surrounding Bull Mountains (Musselshell Valley Historical Museum 1974). The Republic Coal Company, a subsidiary of the Milwaukee Railroad, opened the first commercial mine. Roundup became a "coal camp" with facilities to support more than 100 miners. South of Roundup, the small communities of Klein, Gibbtown, Republic, and Farrelltown developed near the mines.

By 1909, Roundup had a population of 1,500 and was incorporated as a Montana city. The city grew rapidly, reaching a population of 2,434 in 1920 and 2,573 in 1930.

The Klein Mine, located about 3.5 miles south of Roundup, was one of the largest coal mines in the Roundup area. It operated from 1909 until 1956, and employed as many as 550 workers in 1927. More than 20 million tons of coal were taken from the Klein Mine utilizing underground mining techniques. The conversion of railroad engines from coal to diesel ultimately reduced the market for Roundup coal and the mine closed in 1957 (Musselshell Valley Historical Museum, 1974). The last large underground mine in the Roundup area, Roundup Coal Company No.3 Mine, closed in 1962.

There were five small coal mines operating in Musselshell County in 1972 (Intermountain Planners, Inc., 1973). Some were originally underground shaft mines, but in the 1970s, they were converted to surface mines because it was not economically feasible to recover the coal with underground mining methods. Only the PM Mine is still permitted and operating.

The discovery of oil near Roundup in 1919 at Devil's Basin and in 1920 at Cat Creek has provided important economic benefits to Roundup for more than 40 years. Oil well fields expanded and oil supply and service companies located in Roundup (Roundup Record-Tribune, April 6, 1983). Income of residents of the Roundup area has been generated by oil development from leasing, royalty payments, and salaries paid to workers.

Oil production in the Roundup area (i.e., Central Montana Oil and Gas Region) peaked in the 1960s at about 20,000 barrels of oil a day (Montana Department of Natural Resources and Conservation, no date). Oil production has steadily declined from the 1966 peak to approximately 6,500 barrels a day in 1986. During the last few years, the oil and gas industry in the Roundup area has been in a slump, but there are indications that there would be more exploration and production if the price of oil and gas were to increase.

The forest products industry prior to 1972, consisted of small sawmills which produced one to two million board feet of lumber per year. Approximately 142,000 acres of commercial forest in the Bull Mountains provided logs for the mills.

In 1972, Louisiana Pacific, Inc. opened a sawmill in Roundup and the annual harvest of sawlogs increased to 25 million board feet — three times the estimated annual forest growth (Montana Department of Fish, Wildlife and Parks, 1978). The mill was rebuilt and modernized in 1974 and 1975, but closed during the fall of 1976.

Historically, the Roundup area economy has experienced "boom/bust" effects starting with the cattle industry in the 1880s and extending through the coal mining and oil development periods. Many area residents' social values, perceptions, and life-styles have been influenced by the cyclic nature of good economic times followed by economic recession. Long-time residents of the Roundup area take pride in their ability to withstand economically difficult times and view Roundup's past as diverse, colorful, and, at times, romantic. Because of area residents' strong commitment to stay in the area during good, as well as poor economic times, they are concerned about the fate of the area's land, natural resources, businesses, and their life-styles.

Community Organization

Diversification

Social diversity of the study area developed over time as employment opportunities expanded from the agricultural base to include coal mining, oil field work, forest products industries, and railroad operation and maintenance. The early residents of the Roundup area were farmers and ranchers with life-styles, attitudes, and expectations quite different from the industrial workers who came to work in the mines and oil fields. Ranchers in the area are typically conservative politically and in life-style and are committed to frugality, self-reliance, and hard work.

Many ranchers today are long-time residents whose relatives were the first settlers of the area. They live outside of the community of Roundup and have different life-styles and social interaction than Roundup residents.

Mine and oil field workers were often of different ethnic background and religion than the agricultural community. Coal miners were typically union workers with strong social ties to their fellow workers. Their recreation, social interaction, and alliances were often centered around co-workers and families of co-workers. Miners played on baseball teams and competed in other athletic events based upon their employment in the mines. There was a great deal of camaraderie, group spirit, and pride associated with being a coal miner in Roundup.

Typically, miners and other labor groups with strong unions are politically less conservative than ranchers and farmers. Miners in Butte and Anaconda, for example, nearly always elect democratic candidates. Unlike the strongly democratic leanings of Butte and Anaconda miners, coal miners in Roundup historically did not demonstrate strong allegiance to a particular political party. Today, there also is not an obvious political voting pat-

tern of Musselshell County residents. In 1988, Musselshell County elected republicans for national office and fewer democrats than republicans for state and county offices (Table 3.24).

Workers in the petroleum industry are relatively new to Roundup. Many were young men who worked seasonally in the oil fields and moved on when drilling and construction were finished. Because of their transient status, oil field workers did not usually become active in community events or affect the community structure and community interaction of Roundup to a great extent.

Currently, most of the coal mines and sawmills have closed and the oil industry has greatly declined. Many of the early coal miners have left the community, died, or retired, but their families and the community are still well aware of the mining heritage of Roundup.

Interviews with Roundup and Bull Mountains residents revealed that 98 and 95 percent, respectively, of those living in the community today are proud of the mining history of the area. An annual community activity is Miner's Day, a day when miners and their contribution to the community are honored publicly. Reminders of the past mining era include the United Mine Workers Cemetery near Klein and historic houses of miners and other buildings identified as part of the self-guided historical tour of Roundup.

TABLE 3.24

VOTING PATTERNS — MUSSELSHELL COUNTY

	Year of Election		
Election/Office	*1980*	*1984*	*1988*
General Election			
President	Republican	Republican	Republican
U.S. Senator	NA	Democrat	Republican
Representative in Congress	Republican	Republican	Republican
Governor	Democrat	Democrat	Republican
Secretary of State	Republican	Republican	Republican
Attorney General	Unopposed	Democrat	Republican
Superintendent of Public Instruction	Democrat	Republican	Democrat

	Year of Election	
Election/Office	*1986*	*1988*
State and County Election		
County Attorney	Democrat	Appointed
Clerk of District Court	Republican	Republican
Sheriff	Democrat	Democrat
Clerk and Recorder	Republican	Republican
County Commissioners	Democrat (1) Republicans (2)	Democrat (1) Republicans (2)
School Superintendent	Republican	Republican
Treasurer	Republican	Republican
Public Administrator	Republican	Republican
Assessor	Republican	Democrat
Coroner	Democrat	Democrat

NA = Not applicable.

Source: Compiled and published by the Secretary of the State, Helena, Montana.

Today, there is a relatively large population of retired people in Roundup who provide an important link between the past and the present in terms of tradition and culture. Retired people have been identified as a distinct social stratum in Roundup. Perceptions of those interviewed varied as to the role of retirees socially and economically in the community. Some informants indicated that retirees tended to have relatively little influence politically and economically in the community. However, other informants indicated that retired people were an important force, particularly in slowing social change and resisting new ideas and direction of the community.

In recent years, the Bull Mountains area has experienced an influx of people who have sought the seclusion, scenery, and relatively pristine natural surroundings of the area. Many of those interviewed from the Roundup area have termed these newcomers "mini-farmers" because they have purchased small amounts of acreage and have a few animals such as horses, cows, and goats. Residents of Roundup consider mini-farmers to be relatively affluent, young people who have not become integrated into the community and who often share views on development similar to those of the area ranchers. It is perceived by Roundup residents that Bull Mountains residents are becoming somewhat of a social, political, and economic influence because they are organizing to reflect their specific interests (e.g., Bull Mountains Landowners Association, Bull Sheet newspaper, Bull Mountains Volunteers).

Many of the informants in the Bull Mountains indicated that their designation as "mini-farmers" was somewhat derogatory. They often perceive themselves as being discriminated against by the Roundup residents and by the large ranchers because of their short-term residence in the area. An editorial in the Bull Sheet (February 7, 1989) addressed the designation of Bull Mountains residents as mini-farmers. The editorial expressed confusion as to why Bull Mountains residents were perceived as not being part of Roundup. It also stated that "some folks get very angry and some really furious when they are called a mini-farmer."

Some informants from the Bull Mountains commented that they view themselves as "modern pioneers." Many have purchased undeveloped land in the area, cleared the forest, and constructed their own homes. Because of their commitment of time and resources to build their homes, develop roads, and secure a water supply, many residents have a strong personal tie to their home and land.

Extra-local Linkages

The social processes of the study area are influenced by factors and interests outside of the Roundup area. Important decisions concerning the leasing of coal, development of mines, and exploration/extraction of petroleum are often made by individuals, corporations, and regulatory agencies with little or no affinity with the community of Roundup. Whether coal mines, railroads, coal-fired generating plants, or other developments will occur is determined by State and Federal regulatory and land management agencies as well as Burlington Resources (Meridian Minerals) and other large corporations. Decisions about hiring policies, development plans, and mitigation measures are often made in Billings, Helena, Miles City, or other cities far from Roundup. Sixty-four percent of the Roundup area informants

believed groups or organizations outside of the area have a great influence on the area, while 43 percent of the Bull Mountains informants shared this belief.

Linkages between Billings and Roundup are well developed due to the fact that some residents of the area maintain homes or land in both communities. Seventy-five percent of the Roundup area informants and 83 percent of the Bull Mountains informants reported shopping in Billings for articles such as clothing, small appliances, or kitchenware. Both groups considered the close proximity of the Roundup stores to their places of residence as the best feature of shopping in Roundup. Bull Mountains informants thought the worst features of shopping in Roundup were selection of goods and high prices, whereas Roundup informants described the limited selection of goods as the worst feature. Most of the informants also reported travelling to Billings to shop for major purchases such as cars, furniture, and appliances. Billings also attracts area residents for entertainment, athletic events, and medical services, and some residents, particularly in the southern Bull Mountains, commute to Billings for work.

Stratification

Residents interviewed in the study area believe that there are differences in how resources and power are distributed in the community. Both the Roundup and Bull Mountains informants expressed similar perceptions as to the nature of social and economic strata in Musselshell County. Roundup informants most often identified business/professional people as having the most economic and political power in the community, while the Bull Mountains informants thought the large ranchers with a history of several generations in the county had the most economic and political power in the community.

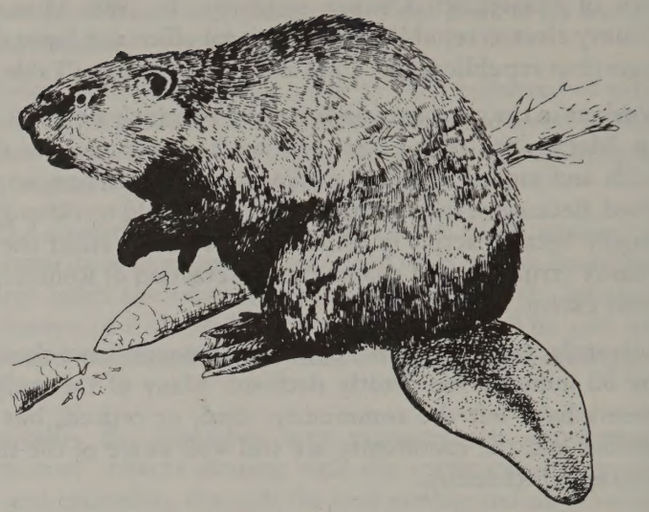
The large ranchers and business/professional people in Roundup were identified as the "power elite" with a disproportionate amount of access to community resources. Long-time residents in both the ranching and business communities possess the most influence and prestige in the community. Professionals and white-collar workers also are viewed as having special status due to their wealth, property, and role in the community. In general, status and power in the community are correlated with income, education, and term of residence in the community.

A distinct middle class in Roundup is composed of retired people. In 1980, approximately 27 percent of the population was over 60 years of age (U.S. Department of Commerce, Bureau of the Census, 1980). As was discussed previously, it is not clear as to how much influence this group has on the social, economic, and political status in the community; however, one informant reported:

It's a pretty good mix of people-like anywhere. There are more retired here and because they are dominant, they pack a lot of weight.

Another informant, recognizing the large number of retired persons in the community, commented that you "need to have the older people behind you for support."

Gold (1985) described the sociocultural attributes of small western towns faced with energy developments. He identified a vulnerable elderly population as a characteristic of many of these communities. Because older people have developed social circles over the course of many years, changes that would drastically



alter their social interaction are a threat to their security in the community. The elderly population in Roundup value their social history in the community and the possibility of major social change may be a cause of anxiety and unwelcome to many.

Residents of the Bull Mountains are also middle class citizens. This group is relatively diverse in their background, term of residence, employment status, and their view of new coal development. Some are retired, others commute to Billings or Roundup for work, whereas others are self-employed, technical, and professional people. Although the majority of the Bull Mountains people appear to be newcomers to the area, many residents were born and raised in Roundup and have moved to the Bull Mountains to raise their families. In general, their desire for isolation, privacy, and personal freedom is a dominant factor that has shaped patterns of communication and coordination. A laissez faire attitude prevails in every day life resulting in a loosely-knit social organization. Although there are not well developed patterns of social interaction among Bull Mountains residents, there is a strong community commitment to cooperating during emergencies such as fires. The common goal of maintaining privacy and personal freedom has fostered a self-enforced system to avoid conflict and resolve it through informal means. Informants expressed the view that conflict was avoided because people tended to mind their own business. Minor conflicts that did arise were dealt with by openly communicating and quickly resolving the issue.

Petroleum company workers currently do not appear to have a large influence on the community. In the past, during the oil boom, workers as well as support services and management were headquartered in Roundup. The transient young exploration and drilling workers were visible socially, but were usually not active in determining the dynamics of community interaction. Those interviewed did not usually identify petroleum workers as a distinct social stratum today.

Unemployed and low income people were identified by respondents as having the least influence on decision-making in the community. Due to the commonly cited lack of jobs and depressed economic conditions of the county, it is likely that this group has expanded in recent years.

Informants in both Roundup and the Bull Mountains often commented that it is difficult to be accepted by the most influential and social groups in the area (i.e., ranchers, business

people, and long-established families). It is perceived by many that well-established cliques exist and that these groups possess and have access to most of the community resources.

Several informants alluded to the fact that they have lived in the community for more than 20 years, but are still considered to be outsiders. One informant reported:

Big ranchers have money and land and have more political clout, like their great-great grandfathers. The big ranchers do not accept most of the people who come in-this is a cliquish town. If you're not born in the general area, you're considered an outsider.

The response of informants in the Roundup area that they are outsiders because they have not lived in the community all of their lives appears to be in contradiction to the common perception that it is easy to get to know people in the area and that newcomers would be easily accepted. About 60 percent of those interviewed expressed the opinion that it is easy to meet people and approximately 80 percent said that they would welcome or easily accept newcomers. Ninety-three percent said that it would be easy for newcomers to become active members of the community.

A similar contradictory response can be seen in studies conducted by Western Analysis (no date) and Economic Consultants Northwest (1989a) to assess the socioeconomic impacts of natural resource development projects in Lincoln County, Montana.

Informants in the survey conducted by Western Analysis (no date) reported that it often requires 15 to 20 years to be socially accepted in the community. However, respondents in the 1989 survey conducted in the same area stated that they believed it was easy to meet people in the area and that they would readily accept newcomers.

The apparent contradiction between acceptance in the community and the perception that the town is friendly and open to newcomers may lie in the degree to which people are integrated into the influence and power base of the community. Although it is easy to meet people casually on a day-to-day basis, it is not as simple to become a participant in the rancher/businessperson/professional strata which has the political and economic control in the community.

Community Coordination and Cooperation

The extent to which various elements of the community coordinate and cooperate often determines the success of solving community problems. In the Roundup area, there are governmental, civic, and charitable or volunteer organizations which influence the social and economic environment of the community and surrounding rural area. In addition, there are groups which have formed to support specific projects or interests.

Informants reported that the County Commissioners are the dominant governmental unit which most strongly directs the course of community affairs. Based on interviews with local residents, many commented that coordination and cooperation between the public and the County Commissioners were not good. Many residents are critical of the policies, decisions, and interests represented by the commissioners. There is a perception by some of the residents that the County Commissioners are secretive and discourage open discussions and consideration of policy decisions that influence the community. About 10 percent of those interviewed in the Roundup area believed that the county government was above average, whereas 64 percent considered it average, and 26 percent reported the county government to be below average. Bull Mountains informants were similar in their rating of the activities of the county government — 2.5 percent considered it above average, 65 percent rated it as average, and 32.5 percent indicated it was below average.

There also does not appear to be widespread community support for the City-County Planning Board, a volunteer organization. In 1988, 200 residents attended a public meeting to protest regulations proposed by the Board concerning land use planning. Discussion was directed at the specific regulations proposed as well as the composition of the Planning Board itself (Roundup Record-Tribune, November 23, 1988).

In contrast to the lack of enthusiasm expressed by some residents for functioning of local governments, many people belong to volunteer, charitable, and civic groups to promote social and economic well-being in the community. Approximately 83 percent of survey respondents thought that there were a lot of community-oriented activities in Roundup. Organizations and support groups in the community include the Musselshell Unity Drive, Musselshell County Food Bank, Meals on Wheels, Alcoholic Anonymous, Alateen, Toys for Tots, church groups, Montana Teenage Institute on Substance Abuse, Teens in Partnership, Alzheimers Support Group, Overeaters Anonymous, and Helping Hands Hospice.

About 92 percent of those interviewed said it is not difficult to organize help for families who have suffered hardships. In an editorial in the Roundup Record-Tribune (August 10, 1988), it stated:

One of the things that really makes a small community tick is volunteerism —concerned citizens who give so much of their time and money to community causes.

It's too bad that somebody can't mosey around the area for awhile and come up with some statistics on the number of people who volunteer to serve a host of different projects. No doubt we'd be astounded by the figures.

The editorial went on to list and compliment the various volunteer organizations in the Roundup area.

Approximately 92 percent of Roundup and Bull Mountains residents interviewed believe that church activities are important to most people of the community. There are a variety of churches in the Roundup area including the denominations of Methodist, Roman Catholic, Lutheran, Jehovah's Witnesses, Latter Day Saints, Church of Christ, Assembly of God, Episcopal, Baptist, and Evangelical.

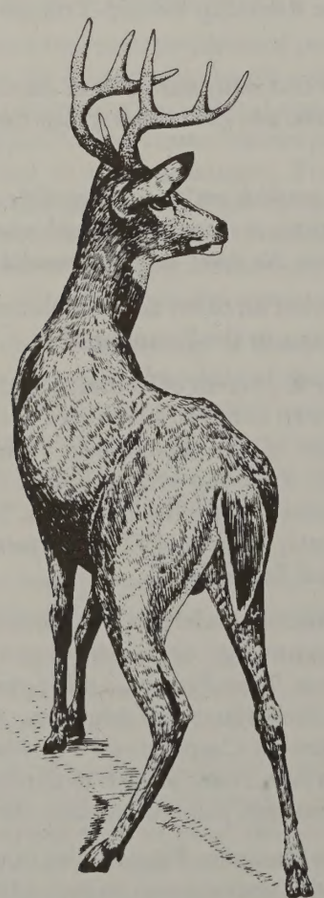
Community projects undertaken in Roundup which indicate a high level of community organization and cooperation include the Main Street Tree Project, Old Town Roundup Project, Musselshell Valley Historical Museum, and the Musselshell Valley Development Corporation. The Main Street Tree Project, initiated in 1988, raised $10,000 to purchase and plant trees in Roundup. Volunteers planted and care for the trees.

The Old Town Roundup Project, also initiated in 1988, developed a self-guided walking tour to depict life during the pioneer period.

One of Roundup's most outstanding examples of community cooperation was the fund drive to re-open the Roundup Memorial Hospital in 1977. The hospital was closed in 1976 because there were no doctors in the community. During 1977, $200,000 was raised by local residents with over 1,000 individuals donating to the hospital fund. As one informant added "there's a good hospital because people in the community have worked their tails off to keep it going through volunteer efforts and donations."

In 1988, the Montana Department of Natural Resources and Conservation initiated a Community-led Rural Economic Development Program for six central Montana counties (Musselshell, Fergus, Wheatland, Judith Basin, Golden Valley, and Petroleum). This pilot project is a grass-roots effort, headquartered in Roundup, to provide local people the knowledge and skills to attract economic development to central Montana. Funding for a full-time program coordinator would be funded by the State and the Soil Conservation Service (Ray Beck, Administrator, Conservation Districts Division, Montana Department of Natural Resources and Conservation, Helena, Montana. Personal communication, February 24, 1989). The Musselshell Valley Development Corporation has prepared a document to formally establish the six-county program. The document presents the objectives, goals, and various development ideas.

The "pull-yourself-up-by-the-bootstraps" approach of the Roundup area residents to reinvigorating the community's economic base also is evident in the development of cottage industries. A workshop was sponsored by the Musselshell Agricultural Alliance, an affiliate of the Northern Plains Resource Council, to promote rural tourism and recreation. Part-time ranch recreation/bed and breakfast businesses, to be operated by local families, are envisioned as a viable economic opportunity in Musselshell County (Roundup Record-Tribune, December 7, 1988). Roundup Wools, a local cottage industry, employs 30 people to spin, knit, and weave wool into handmade garments (Roundup Record-Tribune, November 16, 1988).



In response to concerns that affect specific sectors of the community, interest groups have been formed to address concerns in a coordinated manner. Such groups include the Northern Plains Resource Council, Senior Citizens, Musselshell Agricultural Alliance, 4-H Club, Eastern Coal County Task Force, Bull Mountains Civic Club, Bull Mountains Landowners Association, and POWER. Numerous civic organizations, active in the community of Roundup, include Lions Club, American Legion, Moose, Rotary Club, Masons, Odd Fellows, Eastern Star, Junior Women, Rainbow Girls, and Cowbelles. Community entertainment and recreation events which reflect community involvement include the Tri-county Fair, Harvest Roundup, Community Christmas Party, and Shakespeare in the Park.

Community Interaction

Patterns of how people identify and respond to one another in Roundup are typical of a small town — informal and personal. Residents know almost everyone in town and are aware of individuals' character, occupation, and socioeconomic status. The small town atmosphere, the quiet and predictable pace of life, and mutually supportive networks of family and friends are valued by residents.

Roundup typifies the social organization that is found in many small western towns and cities. According to Gold (1985), this form of social organization is characterized by strong interpersonal bonds, based on shared ideas, mutual trust, traditions, and activities. Members of the community have a deep-seated commitment to the community and neighborhood relationships, with the church being an important social institution. In contrast to the often-mentioned existence of cliques in the community, there are numerous social, civic, and support groups which actively work and interact to provide an improved human and natural environment in the county.

Many of the informants in the Roundup area identified the ranchers as a social stratum distinct from the Roundup residents. To mutually acquaint the ranchers and town residents with the life-styles of both rural and urban aspects of the community, an annual farm-city tour is sponsored by the Musselshell Valley Chamber of Commerce and the Musselshell-Golden Valley Extension Office. Participants of the tour visit both rural areas and the city of Roundup to demonstrate aspects of business, recreation, and every-day life of various sectors of the community.

The recent proposed coal development has polarized some people in the area based upon their support or opposition to new projects. In general, the residents of Roundup favor new coal development, whereas the ranchers and "mini-farmers" are perceived by Roundup residents to oppose it because of potential effects on their life-style and the natural environment.

However, the majority of Bull Mountains informants reported that they were not opposed to the mine. Social interaction between the "pro" and "anti" factions has become more

strained due to the relatively high levels of emotion associated with large-scale development of coal resources and the recent publicity concerning the possible development.

The Northern Plains Resource Council (NPRC), a private interest group headquartered in Billings, was mentioned by informants as opposing coal development. Although NPRC has a relatively small representation in the Bull Mountains (i.e., about 10 people being members of the Bull Mountains Landowners Association, an affiliate of NPRC), they are well organized and effective in articulating their concerns. Members of the Bull Mountains Landowners Association expressed concerns that the proposed mine would adversely affect water supplies and has the potential to create a monopoly by "Burlington Northern" (Meridian Minerals). One informant added that the checkerboard system was established for a reason (i.e., to protect against monopoly) and that system should be maintained.

Community Resources

The availability of resources such as medical care, police and fire protection, schools, mental health facilities, and welfare programs are described in the community services section of this report. The level of community services in Roundup are adequate and, in general, most informants reported the services to be average or above average.

Although water supply and treatment facilities are sufficient, survey respondents often complained about the taste of the water in Roundup. Characteristic of the regional water supply, the water contains a high level of hardness which, to most people, imparts an unpleasant taste. One informant remarked that doctors have warned people with low sodium diets to avoid drinking tap water. Purified water is offered for sale locally; however, people on fixed or low incomes may not be able to afford to purchase the purified water.

Due to budget constraints of the county government, some services have been curtailed. The Montana Department of Social and Rehabilitation Services filed a lawsuit in district court to force Musselshell County to provide adequate funding for social services and protective services to county residents (Roundup Record-Tribune, December 14, 1988). The court, with the consent of the county, found in favor of the state which means the county will need to levy more than 3.03 mills for the poor fund (Russ Cater, Chief Legal Council, Director's Office, Office of Legal Affairs, Montana Department of Social and Rehabilitation Services, Helena, Montana. Personal communication, March 20, 1989). The November 1989 tax statements will reflect this increase to local taxpayers.

The County Mental Health Center has been forced to reduce services available to the public due to budget constraints. According to the Rural Services Supervisor in Billings (Loren Walker, Rural Services Supervisor, Mental Health Center, Billings, Montana. Personal communication, March 14, 1989), the number of caseloads can be managed under the reduced program; however, services have been limited to the chronic mentally ill. Because of the small town atmosphere (i.e., everyone knows everyone), many people seeking such services will travel to Billings to avoid recognition by community residents (Loren Walker, personal communication, March 14, 1989). In addition, due to out-migration of the younger population, the number of caseloads is not as high.

The majority of the survey respondents reported that the Musselshell County Fire Department provided above average fire protection services. Some areas in the county, however, are long distances from the Roundup station and, although emergency response time is quick, closer local fire departments could arrive sooner. Residents of the Bull Mountains have reacted to this situation by actively organizing the Bull Mountains Volunteers to work with the county fire department (see Community Services section). One informant commented that after last year's drought conditions and increased potential for fires, the people in the Bull Mountains realized how vulnerable they and their homes were to loss by fire.

There is a perception by some area residents that access to community resources associated with political and economic power is not equally accessible to everyone. Those who have not lived in the community for a long time, do not come from locally prominent families, or have limited wealth and education believe that they are impeded from equal participation in directing their own destiny as well as that of the community as a whole.

Social Well-being

Social well-being is a subjective concept that is based upon individuals' perceptions of how their lives compare with their expectations of themselves and the community. According to Branch, *et al.*, (1982), the incidence and rate of certain behaviors (e.g., crime, divorce, suicide, family violence, alcohol/drug abuse, welfare rates, school dropouts, and unemployment) are indicators of social well-being.

Informants in Roundup and the Bull Mountains reported most services (e.g., police, fire, medical care) to be average or above average, and about 90 percent of the interviewees are satisfied with the condition and location of their home. Drug and alcohol abuse were identified as the major social problems in the area; however, some informants added that the social problems were no worse than other communities the size of Roundup. With respect to drinking problems, an informant reported:

Musselshell County is not unique from other rural areas such as Judith Basin or Wheatland counties. Drinking is an ingrained part of society, and parents must be impacted before anything gets started to change this.

Informants also mentioned crime as being a problem in the community and that young people need more things to occupy their free time.

Many informants were aware of the Montana Teenage Institute on Substance Abuse (MTI) and Teens in Partnership (TIP) programs that are assisting with alcohol and drug abuse among teens in the community. The TIP Program is aimed at students in grades 7 through 9, while MTI focuses on students in grades 10 through 12. According to the Center for Adolescent Development, MTI brings together "teenagers and professional resources to share information and examine feelings about alcohol/drug misuse and related life problems." The TIP Program trains students to positively and effectively influence friends who may be struggling with adolescent problems such as addictions, suicide, communication, and personal limits.

Interviews with Roundup and Bull Mountains residents indicated that 83 and 93 percent, respectively, believe that the economy is depressed with new jobs being badly needed. Almost

90 percent of the informants thought that young people did not have the opportunity to stay in the area and work because there were no jobs available. In 1987, unemployment in Musselshell County was 10.1 percent compared with 7.4 percent for the state (non-metropolitan areas) as a whole. Of the six central Montana counties (i.e., Musselshell, Golden Valley, Wheatland, Fergus, Petroleum, and Judith Basin), only Wheatland County had a higher unemployment rate (10.9 percent) than Musselshell County (Table 3.25). Per capita personal income in 1986 for Musselshell County ($10,827) was lower than non-metropolitan areas of the state ($11,435). Of the six central Montana counties, only Wheatland and Petroleum counties had lower per capita personal income ($10,620 and $9,432, respectively) than Musselshell County.

The crime rate was 2,706.9 as compared with the statewide rate of 4,270.8 per 100,000 population, ranking Musselshell County 20th of all counties in the State (Table 3.25). The divorce rate was 3.6 per 1,000 population as compared to 5.0 per 1,000 statewide. Out-of-wedlock births for Musselshell County were 1.6 per 1,000 compared with the statewide rate of 2.9 per 1,000 population. Induced abortions in Musselshell County (2.0 per 1,000) were below the statewide rate of 2.8 per 1,000 persons.

Death rates from heart disease and cancer, the two leading causes of death in Montana, were significantly higher in Musselshell County than the statewide rate. The death rates due to heart disease and cancer in Musselshell County were 4.4 per 1,000 and 3.0 per 1,000 population, respectively. The statewide rates for heart disease and cancer were 2.6 and 1.9 per 1,000 persons, respectively.

Attitudes and Concerns

Scoping Process

The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the National Environmental Policy Act of 1969 are contained in 40 CFR Part 1500. These regulations provide for an early and open process for determining the scope of issues to be addressed in an environmental impact statement and identifying the significant issues related to a proposed action. The regulations direct that the term "scoping" be applied to this process. The intent of the scoping process is to ensure that the EIS is responsive to the public, governmental agencies, and other interested parties.

BLM held scoping meetings in Roundup (May 25, 1988) and in Ennis (May 26, 1988). Eighty people attended the meeting in Roundup and 10 people were in attendance at the Ennis meeting. A total of 432 comments were received during the scoping process concerning the proposed mine and land exchange. The highest percentage of comments (13 percent) addressed the question of whether the proposed land exchange would allow Meridian Minerals to tie up coal reserves and establish a monopoly on coal mining and transport in the Bull Mountains. Some concerns were expressed that the government (BLM) and Meridian should not be working together to exclude competition and free enterprise regarding coal mining in the Bull Mountains.

The second most common concern expressed (11 percent) was whether public interests were appropriately served by the land exchange. Some commentors, particularly from Madison County, believed that the land exchange would have a positive effect on recreation. Others believed that the exchange would not be equitable because the lands to be converted to public ownership have no coal values.

The economic impacts, both positive and negative, of the proposed mine and land exchange were mentioned by 10 percent of those responding to the scoping process. Many people expressed the belief that the economy of Musselshell County was depressed and that new jobs and money injected into local businesses would be highly beneficial. Comments also were directed at whether Federal royalties from coal would be lost with the exchange.

TABLE 3.25

COMPARISON OF SELECTED SOCIAL WELL-BEING INDICATORS OF 6 CENTRAL MONTANA COUNTIES

Characteristic	*Montana*	*Musselshell County*	*Golden Valley County*	*Wheatland County*	*Fergus County*	*Petroleum County*	*Judith Basin County*
Population (1987)	809,000	4,500	1,100	2,200	12,300	600	2,500
Per Capita Personal Income (1986)[1]	$11,435	$10,827	$12,436	$10,620	$11,434	$9,432	$10,979
Unemployment Rate (1987)	7.4%	10.1%	9.1%	10.9%	8.8%	4.5%	5.3%
Crime Rate (1987)[2]	4270.8	2706.9	NA	1472.6	3174.4	NA	856.4
Out-of-Wedlock births/1,000 (1987)	2.9	1.6	1.8	1.4	1.2	1.7	0.8
Heart Disease Death/1,000 (1987)	2.6	4.4	3.6	5.5	3.4	0	4.0
Cancer Death/1,000 (1987)	1.9	3.8	0.9	4.5	1.6	1.7	1.6
Divorces/1,000 (1987)	5.0	3.6	0	4.1	4.9	6.7	2.0
Induced Abortions/1,000 (1987)	2.8	2.0	0	1.4	1.6	0	2.4
Suicide/1,000 (1987)	0.2	0.2	0	0	0.1	0	0

Sources: 1) Montana Department of Health and Environmental Sciences, Bureau of Records and Statistics, Helena, Montana.
2) U.S. Department of Commerce, Bureau of Economic Analysis, 1988.
3) Montana Board of Crime Control, Criminal Justice Data Center, Helena, Montana.

[1]Non-metropolitan portion, excluding Billings and Great Falls.

[2]Crime rate is obtained by dividing the total number of index crimes by the population of the law enforcement jurisdiction and multiplying by 100,000.

Other concerns were how the proposed mine would affect transportation (5 percent) and water quality (5 percent). Traffic and quality of roads and highways were described as currently being county problems. Increased truck traffic hauling coal was viewed as an inconvenience to local drivers, a safety hazard (particularly to school children on busses), and potentially damaging to road surfaces.

Water quality and quantity changes as a result of the mine are viewed by some as serious potential environmental impacts. Currently, water quality is poor and quantities of water are not adequate for irrigation demands. Existing springs are considered to be very important to agricultural operations.

Two percent of the commenters thought that the project would have social impacts. One commenter believed that the proposed mine would promote a beneficial social change in Roundup, while another was concerned that Roundup would become a "company town" and lose its existing social structure.

Survey Results

Scoping concerns also were identified by Economic Consultants Northwest (1989b) through interviews with Roundup and Bull Mountains area residents. Concerns most often expressed about the land exchange were whether the exchange would lead to a coal and transportation monopoly; whether the land exchange would be equitable in terms of land values and resources; and whether access to hunting and recreation would be reduced. Other concerns (e.g., impacts on water, environmental effects, impacts on roadways) were expressed even though they are not directly related to the land exchange itself.

Potential positive and negative impacts that could occur with development of the mine and coal transportation were identified by informants in the Roundup and Bull Mountains area. Positive impacts that area residents expect with the project would be more jobs and improved economic conditions. Seventy-eight percent of the comments from the Bull Mountains informants focused on favorable employment and economic benefits that would be realized with the project. Similarly, the majority of the Roundup informants (76 percent of the comments) believed that more jobs and improved economic conditions would result from the project. Seventy-one percent of those interviewed in the Bull Mountains and 69 percent in the Roundup area indicated that, if in need of a job, they would be willing to work at the mine.

When asked about possible negative impacts, approximately 50 percent of the Roundup and 83 percent of the Bull Mountains informants identified adverse impacts, while the remaining 50 percent and 17 percent of the Roundup and Bull Mountains respondents either responded "none" or did not comment. Potential impacts included: degradation of water quality and losses or reductions in water supplies; accelerated damage to roads and highways; increased traffic, noise, and dust; and reduction in the quality of life due to increased population, drugs, crimes, and welfare recipients. The possibility that many workers would be hired non-locally also was viewed negatively because of the perception that the local work force is underemployed.

Community Services

Education

In Musselshell County, the elementary, middle, and high schools are located in Roundup (School Districts No.55 and 55H). The Central Elementary School, serving grades kindergarten through 6, employs 22 teachers, seven teacher aides, one administrator, one clerical person, two custodians, and 12 other workers including housekeepers, kitchen help, and playground and crosswalk attendants. The number of staff employed by the school is an adequate number to provide the students with the quality of education expected by the local community (Jay Erdie, Superintendent, School District No.55, Roundup, Montana. Personal communication, February 24, 1989).

The Roundup middle school (grades 7 and 8) and high school (grades 9 through 12) share the same building. The community library also is housed in the school building. The City of Roundup and Musselshell County contribute financially to the maintenance and operation of the library and employ the librarian.

The middle school employs seven teachers, three teacher aides, a half-time administrator and clerical worker, and one custodian. Based on current enrollment, no additional staffing needs are required to provide the students with the quality of education expected by the local community (Jay Erdie, personal communication, February 24, 1989).

The Roundup High School has a staff of 26 people; 18 teachers, three teacher aides, a half-time administrator and clerical worker, one custodian, and three housekeepers. Similar to the elementary and middle schools, there is a sufficient number of staff employed by the high school (Jay Erdie, personal communication, February 24, 1989).

Student enrollment in Roundup schools has been declining in recent years and is expected to continue this downward trend through 1993 (Table 3.26). In grades kindergarten through 8, enrollment increased by 18.7 percent from 530 students in 1980 to a high enrollment of 629 students in 1984. Since 1984, enrollment has been declining and, in school year 1988/89, enrollment reached a low of 487 students, a 22.6 percent decrease from 1984.

TABLE 3.26

ACTUAL AND PROJECTED SCHOOL ENROLLMENT — ROUNDUP SCHOOL DISTRICT #55 AND 55H

Year	*Grades K-8*	*Grades 9-12*	*Special Education*	*Total All Grades*
Actual				
1980	530	186	9	725
1981	529	181	10	720
1982	553	167	21	741
1983	572	166	19	757
1984	629	178	18	825
1985	624	171	13	808
1986	526	237	20	783
1987	478	242	13	733
1988	487	210	12	709
Projections				
1989	481	212	12	705
1990	467	215	12	694
1991	442	202	12	656
1992	431	199	11	641
1993	421	187	11	619

Source: 1) Montana Office of Public Instruction, Helena, Montana.
2) Economic Consultants Northwest, Helena, Montana, 1989b.

In grades 9 through 12, school enrollment fluctuated between 1980 and 1987, from a low of 166 in 1983 to a high of 242 in 1987. Between 1987 and 1988, enrollment decreased by 13.2 percent or 32 students in grades 9 through 12 (Table 3.26).

School enrollment projections for the Roundup School District were made using a grade retention model (Appendix 9). Enrollment for all grades is projected to continue a downward trend, decreasing by 12.2 percent between 1989 and 1993 and reaching a low of 619 students by 1993 (Table 3.26).

Based on current enrollment figures, there is sufficient classroom space for all grades in the Roundup schools. If students were evenly distributed within grades, the school could accommodate the following number of students without constructing additional classrooms: approximately 25 to 27 students in grades kindergarten through 6, about 40 to 45 students in grades 7 and 8, and an estimated 45 to 50 students in grades 9 through 12 (Jay Erdie, personal communication, February 24, 1989).

Current Montana recommendations for student/teacher ratios in single classroom situations are 24 students per teacher for kindergarten, 26 students per teacher for grades 1 and 2, 28 students per teacher for grades 3 and 4, and 30 students per teacher for grades 5 through 8. This averages to approximately 28 students per teacher for grades kindergarten through 8. Based on 1988/89 school enrollment of 487 students, Roundup Elementary School District had 16.8 students per teacher.

The recommended standard of the State of Montana for maximum number of students per teacher in grades 9 through 12 is 30 students per teacher. Using the 1988/89 enrollment of 210 students, the student/ teacher ratio for Roundup High School District was 11.7 students per teacher.

Law Enforcement

In the Musselshell County study area, law enforcement services are provided by the Musselshell County Sheriff's Department and the Montana Highway Patrol. The Sheriff's Department is a consolidated city (Roundup) and county law enforcement agency headquartered in Roundup serving an estimated population of 3,700. There are five sworn officers (including the Sheriff and undersheriff) and five dispatchers. Typical standards for number of police officers per 1,000 population in small western United States communities are 1.4 to three officers per 1,000 people (Mountain West Research, Inc., January 1979).

The current number of officers provides the county with 24-hour patrol coverage; however, more officers could be used to patrol the outlying areas (Brian Neidhardt, Sheriff, Musselshell County Sheriff's Department, Roundup, Montana. Personal communication, June 24, 1988). Due to county budget constraints, the only officer responsible for patrol activities in the Melstone area was recently laid off. The Melstone deputy was the area's sole means of rapid response to law enforcement and medical emergencies (Roundup Record-Tribune, August 24, 1988).

The Sheriff's Department owns three emergency vehicles. According to Sheriff Neidhardt, an additional emergency vehicle is needed (personal communication, February 21, 1989). Standards for number of emergency vehicles vary from one vehicle per each patrol officer to one vehicle per every three officers. The actual number of vehicles needed depends upon the town's particular needs (Mountain West Research, Inc., January 1979).

The 14-bed county jail is the only detention facility within Musselshell County. The department can concurrently house female, male, and juvenile offenders in the facility. Minor adjustments in the jail should be made to maintain current requirements (Brian Neidhardt, personal communication, February 21, 1989).

Musselshell County had a crime rate of 2,706.9 per 100,000 population in 1987, a rate well below the Montana average of 4,270.8 per 100,000 population (Table 3.27). Musselshell County ranked 20 among the 46 reporting counties in number of index crimes (homicide, rape, robbery, aggravated assault, burglary, larceny/theft, motor vehicle theft) per 100,000 population.

The highest crime rate was 6,426.8 per 100,000 population reported by Lewis and Clark County and the lowest rate (242.9) was reported by McCone County.

In 1987, there were 123 index crimes reported by the Sheriff's Department for Musselshell County. This number was slightly lower than the number of crimes reported in 1986 (131 index crimes), but higher than the number reported in 1984 and 1985 (108 and 109, respectively).

The Yellowstone County Sheriff's Department, in conjunction with the Montana Highway Patrol, patrols and responds to emergency situations on U.S. Highway 87 within Yellowstone County. There is one resident deputy who is responsible for law enforcement activities on U.S. Highway 87 and the area between the highway and Huntley. The Sheriff believes that this is not an adequate number of officers for this area and that at least one additional deputy is needed (Mike Schafer, Sheriff, Yellowstone

County Sheriff's Department, Billings, Montana. Personal communication, June 29, 1988).

Due to state budget reductions, the Montana Highway Patrol recently laid off one of the two officers that patrol areas in Musselshell County (Lieutenant Colonel Robert Griffith, Field Force Bureau Chief, Highway Patrol Division, Montana Department of Justice, Helena, Montana. Personal communication, March 13, 1989). If one officer is not enough to adequately patrol the area, a Billings officer will be recruited to assist (Lieutenant Colonel Robert Griffith, personal communication, June 24, 1988).

TABLE 3.27

NUMBER OF INDEX CRIMES IN MUSSELSHELL COUNTY
(1984, 1985, 1986, AND 1987)

Type of Crime	*1984*	*1985*	*1986*	*1987*
Index Crimes				
Homicide	0	0	0	0
Rape	1	0	0	0
Robbery	1	0	0	0
Aggravated Assault	7	15	3	8
Burglary	29	25	44	25
Larceny/Theft	62	61	77	81
Motor Vehicle Theft	8	8	7	9
Total	108	109	131	123
Crime Rate Per 100,000[1]				
Musselshell County	2,297.9	2,313.7	2,799.7	2,706.9
State of Montana	4,246.1	4,231.0	4,226.9	4,270.8

Source: Montana Board of Crime Control, Criminal Justice Data Center, Helena, Montana (1984, 1985, 1986, and 1987).

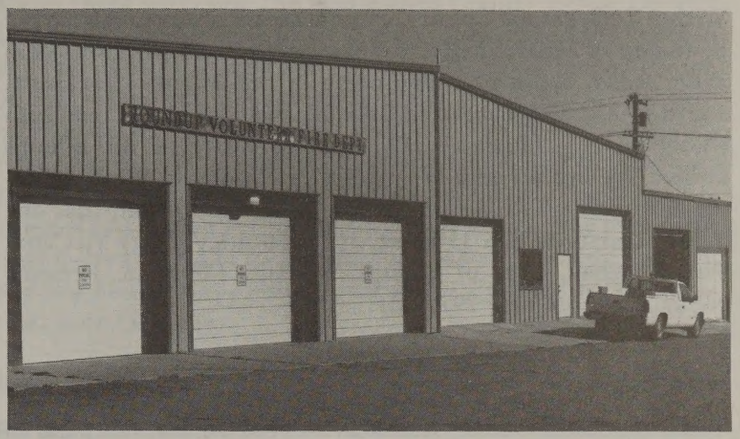
[1]Crime rate is obtained by dividing the total number of index crimes by the population of the law enforcement jurisdiction and multiplying by 100,000.

Fire Protection

Fire protection in the Musselshell County study area is provided by Musselshell County Volunteer Fire Department,Roundup Volunteer Fire Department, and the Bull Mountains Volunteers. Although the Musselshell County Fire Department has the responsibility for handling fires within the entire county, there are two other departments located in Melstone and Musselshell that assist in firefighting activities in the eastern portion of the county. Fire suppression on public lands within Musselshell County is the responsibility of the Montana Department of State Lands and the Bureau of Land Management.

The Mussellshell County and Roundup Fire departments have 28 active volunteers; all have received firefighting training. The fire departments respond to approximately 80 emergency calls a year (20 in Roundup and 60 in Musselshell County).

The combined departments maintain eight fire vehicles (four pumpers, two tankers, one brush fire truck, and one communication van). For small communities (up to 30,000 people), two pumpers and a staff car are considered adequate basic equipment and about 20 volunteer firefighters would be sufficient to operate one pumper (Mountain West Research, Inc., January



1979). In Montana, the number of volunteer firefighters is limited to 28.

The equipment is considered to be appropriate and in good condition (Donald Picchioni, Assistant Fire Chief, Musselshell County Fire Department, Roundup, Montana. Personal communication, February 27, 1989). On a scale from 1 to 10, with class 1 being the highest rating and 10 being unprotected, Roundup has a class 6 fire protection rating (Earl Huestis, Field Representative, Insurance Service Organization, Great Falls, Montana. Personal communication, June 24, 1988). There are excellent fire flows (a measurement of the capacity of a water system to provide water for firefighters) in Roundup (Donald Picchioni, personal communication, June 24, 1988).

Recognizing the need for more immediate fire protection services in the Bull Mountains area, the Bull Mountains Volunteers started organizing their firefighting effort in 1988. Since that time, local residents have elected officers (including a fire chief and assistant fire chief) and are preparing the necessary paperwork to become incorporated. The service area encompasses about a 30 mile by 20 mile area in the Bull Mountains within Musselshell County and provides fire protection to about 500 families.

The Bull Mountains Volunteers has about 125 volunteers. Because the department is still new, no volunteers have received firefighting training. The Montana Department of State Lands will be providing training to at least 45 volunteers in the near future.

Last year, volunteers canvassed the 500 households in the area obtaining telephone numbers of residents and gathering pertinent information for evacuation activities (e.g., whether a member of the household was handicapped or whether there were elderly persons within the household). At this time, the only fire equipment that the fire department has available is hand tools provided by DSL. Fire protection clothing is not yet available to the firefighters and the four emergency vehicles are "homemade" slide-in units similar to those used by DSL. Water tanks with 300 to 500 gallon capacities and pumps, donated by community residents, are slid into the back of four-wheel drive pickup trucks to suffice as fire trucks.

Volunteers are notified through a "inverted pyramid" type system in which the first person calls designated volunteers, who, in turn, contact volunteers on their list. Within 20 minutes, all available volunteers can be contacted to respond to a fire (JoAnne Smith, Volunteer, Bull Mountains Volunteers, Roundup, Montana. Personal communication, March 10, 1989).

Within Yellowstone County, there is no fire protection from the boundary of Musselshell and Yellowstone counties until Alexander Road, about one mile north of the Billings city limits. South of Alexander Road to Billings, and within one mile southeast on U.S. Highway 312 (Huntley Road), is the Billings Urban Fire Service area. The Huntley Volunteer Fire Department is responsible for firefighting activities beyond that one mile boundary on U.S. Highway 312 to Huntley (Larry McCann, Fire Marshall, City of Billings, Billings, Montana. Personal communication, June 29, 1988).

Ambulance Service

The Musselshell County Ambulance Service in Roundup has an estimated service area population of 4,500 and averages about 240 emergency calls annually. They have responded to emergency calls in Musselshell County and in adjacent counties (Rosebud, Fergus, Wheatland, Golden Valley, and Yellowstone).

The ambulance service is staffed by 18 volunteers, all of which are certified Emergency Medical Technicians (EMTs). More volunteers are needed to provide the community with more reliable service (Marion Ferguson, Volunteer, Musselshell County Ambulance Service, Roundup, Montana. Personal communication, June 24, 1988).

The ambulance service owns two radio-equipped ambulances. The condition of the ambulance barn and equipment are considered to be good. In addition, the available equipment is considered to be appropriate to adequately serve the community (Marion Ferguson, Volunteer, Musselshell County Ambulance Service, Roundup, Montana. Personal communication, February 21, 1989). For small towns (up to 30,000 people), one ambulance is considered adequate (Mountain West Research, Inc., January 1979).

Four ambulance services in the Billings area were contacted concerning number of personnel, available equipment, and number of emergency vehicles available for responding to emergency situations. The following provides a brief description of the ambulance services:

(1) *Billings Ambulance Service*: Twenty-two ambulance attendants; 18 of the 22 are EMTs; and five radio-equipped emergency vehicles equipped with hand tools (Richard Taylor, Owner, Billings Ambulance Service, Billings, Montana. Personal communication, March 13, 1989).

(2) *Arrow Medical Services*: Eighteen ambulance attendants; all attendants certified EMTs; one or two attendants trained in emergency mine rescue; four radio-equipped emergency vehicles; three of the four emergency vehicles have such equipment as chains, pulleys, wedges, pry bars, and air chisels (Robin Pinkstaff, Crew Chief, Arrow Medical Services, Billings, Montana. Personal communication, March 13, 1989).

(3) *Deaconess Medical Center*: Twenty-two ambulance attendants; 11 of the 22 are EMTs; two radio-equipped emergency vehicles with full advanced life support (including drugs, monitoring equipment, and intravenous solutions), full extrication tools (including wedges, cutting tools, and air chisels); two fixed-wing air ambulances (Bill Newell, Dispatch Coordinator, Deaconess Medical Center, Billings, Montana. Personal communication, March 13, 1989).

(4) *St. Vincent Hospital and Health Center*: No on-the-ground ambulance service provided; one fully-equipped helicopter and one fully-equipped fixed-wing aircraft; pilot, EMT, and registered nurse on board of aircraft/helicopter to provide emergency service under the direction of a physician at the hospital (Marlene Sorg, Flight Nurse, St. Vincent Hospital, Billings, Montana. Personal communication, March 13, 1989). All ambulance services reported that there were a sufficient number of ambulance attendants, emergency vehicles, and adequate equipment.

Hospitals and Long-Term Care Facilities

The only licensed hospital in Musselshell County is the Roundup Memorial Hospital and Nursing Home. The 17-bed hospital has a staff of 70 employees including two full-time physicians, one part-time physician, seven Registered Nurses, and 12 consulting physicians from Billings (Fern Mikkelson, Administrator, Roundup Memorial Hospital and Nursing Home, Roundup, Montana. Personal communication, June 24, 1988 and March 10, 1989). Based on a standard of four beds per 1,000 population (Mountain West Research, Inc., January 1979), there is an adequate number of available beds at the Roundup Hospital.

The number of hospital patient days has decreased significantly since 1984 at the Roundup Memorial Hospital. In the annual survey of hospitals conducted by the Montana Department of Health and Environmental Sciences with the assistance of the Montana Hospital Association, the hospital reported 2,147 hospital patient days in 1984 and, in 1987, they reported 479 hospital patient days, a decrease of 77.6 percent (Montana Department of Health and Environmental Sciences, 1988).

The Roundup Memorial Nursing Home is in the same building as the hospital. In 1987, 21 beds were added, increasing the number of licensed beds to 37 at the nursing home. The nursing home reported 5,744 patient days in 1985, 5,380 in 1986, and increasing to 10,558 patient days in 1987, an 83.8 percent increase over the three-year period (Montana Department of Health and Environmental Sciences, 1988).

Local Physicians

The Roundup Family Medical Center is served by two full-time general practitioners and a part-time physician from Billings who visits the clinic three times a week. Roundup also has one dentist and one optometrist. A recommended number of physicians is 1 per 1,000 population and for dentists 0.5 per 1,000 (Mountain West Research, Inc., January 1979).

The Musselshell Chemical Dependency Center and Musselshell County Mental Health Center also provide services to residents of Musselshell and Golden Valley counties. The Chemical Dependency Center provides out-patient counseling, makes referrals to patients for in-patient care, and operates the Assessment Court Treatment (ACT) Program (mandatory classes for DUI offenders). Staff at the Center includes one counselor and a secretary who also provides secretarial services for the Musselshell County Mental Health Center (Delores DesJarlais, Secretary, Musselshell Chemical Dependency Center/Musselshell County Mental Health Center, Roundup, Montana. Personal communication, March 13, 1989).

The Mental Health Center is a branch office of the Billings Mental Health Center. Due to reduced budgets, a counselor from Lewistown visits Roundup one day a week to counsel the chronic mentally ill in Musselshell County. By July 1989, they hope there will be sufficient funds to employ a full-time counselor (Delores DesJarlais, personal communication, March 13, 1989).

Water Supply

Roundup obtains municipal water from two water sources, each combining into a main pump station. The majority of the municipal water comes from an abandoned coal mine on the south side of the Musselshell River, which is supplemented by water from an infiltration gallery adjacent to the Musselshell River. Water is pumped across the river by two 1,000 gallons per minute (gpm) pumps to the main pump station. Two pumps (900 and 1,400 gpm) at the main pump station pump the water into the water distribution system. Water treatment consists of chlorination and fluoridation.

There are approximately 1,000 service connections hooked into the system with capacity far exceeding utilization (Gary Thomas, Director of Public Works, Roundup, Montana. Personal communication, February 20, 1989). Operation and maintenance of the water system have been rated as very good by the Montana Department of Health and Environmental Sciences (Montana Department of Health and Environmental Sciences, Water Quality Bureau, June 10, 1986).

Water storage facilities consist of two concrete reservoirs with two million and one million gallon capacities (Gary Thomas, personal communication, June 24, 1988). Pumping and storage facilities are seven years old and the last major improvements to the system were made in 1982.

There appears to be a considerable water source and pumping and storage capacity (Jerry Burns, Environmental Program Manager, Montana Department of Health and Environmental Sciences, Water Quality Bureau, Billings, Montana. Personal communication, June 24, 1988).

Wastewater Treatment

Wastewater treatment (sewage) facilities serving Roundup consist of a two-cell facultative lagoon system constructed in 1958. The first cell is 12 acres and the second cell is four acres. The lift station at the lagoon was completely rebuilt in 1987. Treated wastewater is not discharged into any watercourse. The lagoon is well maintained and in adequate condition (Jerry Burns, personal communication, June 24, 1988). According to Public Works Director Gary Thomas, the system is underutilized (personal communication, February 20, 1989).

Solid Waste

Solid waste collection and disposal services in Roundup are provided by the City of Roundup. Refuse is hauled to the Roundup transfer station where it is picked up and hauled by Big Sky Haul-Away, a private contractor, to a Billings landfill (Jim Leiter, Environmental Engineer, Water Quality Bureau, Montana Department of Health and Environmental Sciences, Helena, Montana. Personal communication, June 15, 1988).

About three years ago, the Musselshell County Refuse District developed a countywide waste disposal operation. Solid waste in all communities within Musselshell County is hauled to the county-owned transfer station building in Roundup. The caretaker/manager of the transfer station is employed by Big Sky Haul-Away. On the average, annually, they haul six, 40-cubic yard loads of garbage a week. There would need to be a large influx of population within the county to increase the number of trips currently made to the landfill (Dennis Johnston, Owner, Big Sky Haul-Away, Billings, Montana. Personal communication, June 15, 1988).

Social Welfare

Funding for social welfare services in Musselshell County come from State, Federal, and County sources. The welfare program is administered by the county and provides the following services:

(1) Aid to families with dependent children.
(2) Food stamps.
(3) County assistance (medical and general).
(4) Medicaid.

The staff consists of one eligibility technician and one clerical position. The director of the program operates out of the Lewistown office and is responsible for six counties (Fergus, Wheatland, Golden Valley, Petroleum, Musselshell, and Judith Basin).

The current number of staff in Roundup can adequately dispense the required services except for three months of the year (December, January, and February) when the number of caseloads increase (Bonnie Braunbeck, Director, Social Welfare Services, Lewistown, Montana. Personal communication, June 24, 1988). Personnel have been rotated from the offices within the six-county jurisdiction to alleviate workloads during high caseload periods.

Per capita cases per month for families receiving aid to families with dependent children (AFDC) payments in Musselshell County was lower than that reported for the state as a whole (Table 3.28). The average monthly payment per case was $319.96 in 1988, as compared to the state average payment of $333.78. Similarly, per capita food stamp cases per month for Musselshell County was reported to be lower relative to the state average, as well as the average value of food stamps per case ($120.79 for Musselshell County and $135.56 for the state).

In 1988, AFDC per capita cases per month for Yellowstone County were also lower than the state average (Table 3.28); however, the average monthly payment per case was higher relative to the state ($340.35 for Yellowstone County and $331.73 for the state). Although the average number of cases per capita per month for medical assistance was similar for Musselshell County, Yellowstone County, and the State, the average monthly payment per case was lower in Yellowstone County in 1988 than in both Musselshell County and Montana.

HOUSING

Communities within the study area include Roundup (Musselshell County) and Billings (Yellowstone County). Because housing is not limited in the Billings area, more emphasis has been placed on the Roundup area with respect to available housing units.

TABLE 3.28

SELECTED SOCIAL WELFARE STATISTICS — MONTANA, MUSSELSHELL COUNTY, AND YELLOWSTONE COUNTY (FY 1986, 1987, 1988)

Characteristics	State of Montana			Musselshell County			Yellowstone County		
	1986	1987	1988	1986	1987	1988	1986	1987	1988
Aid to Families with Dependent Children									
— Average Number of Cases/Month	8,675	9,320	9,628	27	33	28	902	1,010	1,087
— Average Number of Cases/Month/Capita	.011	.012	.012	.006	.007	.006	.008	.009	.009
— Average Monthly Payment/Case	$326.10	$328.63	$331.73	$333.78	$323.52	$319.96	$340.67	$335.99	$340.35
Food Stamps									
— Average Number of Households/Month	21,537	22,066	21,635	89	92	84	2,095	2,176	2,367
— Average Number of Cases/Month/Capita	.026	.027	.027	.019	.020	.019	.018	.018	.020
— Average Value of Food Stamps/Case	$121.92	$123.89	$135.56	$112.28	$114.16	$120.79	$120.51	$123.75	$134.45
Medical Assistance									
— Average Number of Cases/Month	21,405	24,926	26,207	94	116	110	2,470	2,883	3,150
— Average Number of Cases/Month/Capita	.026	.031	.032	.020	.026	.024	.021	.024	.027
— Average Monthly Payment/Case	$411.06	$432.49	$449.87	$270.81	$284.98	$402.67	$306.49	$334.71	$376.66

Sources: 1) Montana Department of Health and Environmental Sciences, Bureau of Records and Statistics, Helena, Montana, 1986, 1987, and 1988.
2) U.S. Department of Commerce, Bureau of the Census, Current Population Report, 1987.

Housing availability and characteristics were assessed through personal interviews conducted with mobile home park owners, apartment complex owners, and realtors; from data compiled by the U.S. Bureau of the Census, Montana Department of Health and Environmental Sciences, and other published and unpublished documents; from an inventory of real estate listed in the classified section of the Roundup Record-Tribune and the Billings Gazette; and through an on-site reconnaissance housing inventory.

Housing units for sale and rent are ever-changing, thus providing up-to-date information on available housing is difficult. The U.S. Bureau of Census data, for example, are nearly ten years old, but provide a general overview of the housing situation in the study area and are the only descriptive information available in such detail.

Housing Characteristics

Based on U.S. Bureau of the Census data (1980), there were 1,997 year-round housing units in Musselshell County in 1980 (Table 3.29). Approximately 54 percent of these units (1,073 homes) were located in Roundup. The vacancy rate was 15 percent in Musselshell County and 14 percent in Roundup.

TABLE 3.29

CHARACTERISTICS OF YEAR-ROUND HOUSING IN MUSSELSHELL COUNTY AND ROUNDUP, 1980

Housing Characteristics	Musselshell County		Roundup		Yellowstone County		Billings	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Total Year-Round Housing Units								
Number Occupied	1,698	85.0%	923	86.0%	39,891	93.4%	26,265	93.9%
Number Vacant	299	15.0%	150	14.0%	2,798	6.6%	1,719	6.1%
Total	1,997	100.0%	1,073	100.0%	42,689	100.0%	27,984	100.0%
Year-Round Housing Units by Units in Structure								
One Unit (Attached and Detached)[1]	1,454	72.8%	798	74.4%	29,132	68.2%	18,360	65.6%
Two Unit	66	3.3%	49	4.6%	3,078	7.2%	2,576	9.2%
Three and Four Units	25	1.3%	16	1.5%	2,035	4.8%	1,689	6.0%
Five Units or More	132	6.6%	115	10.7%	4,642	10.9%	3,989	14.3%
Mobile Homes or Trailers	320	16.0%	95	8.8%	3,802	8.9%	1,370	4.9%
Total	1,997	100.0%	1,073	100.0%	42,689	100.0%	27,984	100.0%
Year-Round Housing Units by Year Built								
1939 and Earlier	1,069	53.5%	691	64.4%	7,393	17.3%	5,169	18.5%
1940-1969	423	21.2%	218	20.3%	20,454	47.9%	15,514	55.4%
1970-1980	505	25.3%	164	15.3%	14,842	34.8%	7,301	26.1%
Total	1,997	100.0%	1,073	100.0%	42,689	100.0%	27,984	100.0%

Source: U.S. Department of Commerce, Bureau of the Census, Census of Population and Housing, 1980.

[1]One unit, detached = One-unit structure detached from any other house. One unit, attached = One-unit structure which has one or more walls extending from ground to roof separating it from adjoining structures.

Of all year-round housing, about 73 percent were classified as one-unit structures in both the county and Roundup. Sixteen percent of year-round housing in Musselshell County were mobile homes, while 8.8 percent were mobile homes in Roundup.

A large proportion of the homes in Roundup were built prior to 1940 (Table 3.29). In 1980, 64.4 percent of year-round housing units in Roundup were constructed prior to 1940 as compared to 53.5 percent for Musselshell County. Since the 1980 census, more building activity has occurred in rural Musselshell County than in Roundup.

Unlike Musselshell County, of the 42,689 year-round housing units in Yellowstone County, 17.3 percent were built prior to 1940 and 18.5 percent were constructed before 1940 in Billings. Approximately 65 percent (27,984) of the year-round homes in Yellowstone County are located in Billings (Table 3.29). About two-thirds of the year-round housing units were classified as one-unit structures in both the county and Billings, while mobile homes accounted for almost 9 percent of all year-round housing in Yellowstone County and about 5 percent in Billings.

Real Estate For Sale

Real estate for sale and housing units for rent were monitored in the real estate classified section of the Roundup Record-Tribune, the local newspaper in Roundup. Beginning in September 1988 and ending in February 1989, real estate and rentals advertised in every other issue of the newspaper were recorded and a weekly average for the six-month period was calculated (Table 3.30).

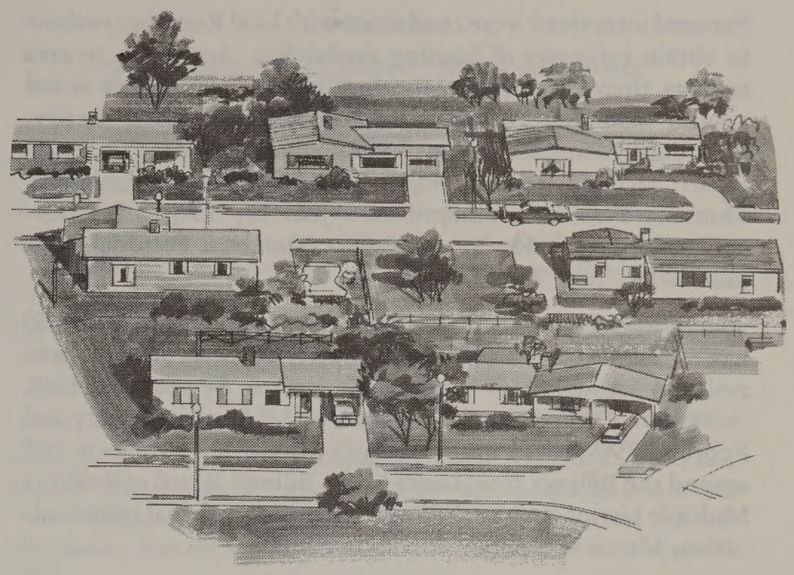
TABLE 3.30

6-MONTH MONITORING OF REAL ESTATE FOR SALE AND HOUSING UNITS FOR RENT — MUSSELSHELL COUNTY STUDY AREA

Types of Housing	*Average Number Per Week*	*Range*
Homes For Sale	2	Price: $7,000 to $159,900
		# Bedrooms: 2 to 5
		# Acres: 0 to 216 acres
Mobile Homes for Sale	1	Price: $10,500 to $37,000
		# Bedrooms: 1 to 3
		# Acres: 0 to 55 acres
Acreage For Sale	0[1]	# Acres: 24 to 40 acres
Rental Housing Units		
Homes	4	Rent: $90 to $300
Apartments	3	Rent: No Prices Listed
Mobile Homes	1	Rent: $150 and No Price Listed

Source: Roundup-Record Tribune, Roundup, Montana, September 1988 through February 1989. Every other issue was used during this monitoring period to derive the average used in this table.

[1]Only 3 parcels listed in 6-month monitoring period.



An average of two homes were listed for sale in the Roundup Record-Tribune during the six-month monitoring period. Homes ranged in price from $7,000 to $159,900, depending upon the condition, size, and location of the home and whether acreage was included in the selling price (Table 3.30). Number of bedrooms ranged from two to five, while acreage ranged from 0 to 216 acres.

The classified section of the Sunday edition of the Billings Gazette lists by area the number of HUD and VA repossessed homes for sale. In June 1988, the classified section in the Billings Gazette was monitored to determine the number of repossessed HUD and VA homes that were for sale in Roundup. During June 1988, an average of four repossessed HUD or VA homes were listed for sale, ranging in price from $2,000 to $39,000 (Table 3.31).

TABLE 3.31

REPOSSESSED HOMES (VA OR HUD) IN ROUNDUP

Date	*VA or HUD*	*Price of Home*	*Number of Bedrooms and Baths*
June 5, 1988	VA	$5,000 cash	2 bdrm, 1 bath
	HUD	$8,000	4 bdrm, 1 bath
	HUD	$12,000	1/3 bdrm, 1 1/2 baths
	HUD	$39,000	3 bdrm, 1 1/2 baths, 17 acres
June 12, 1988	VA	$5,000 cash	2 bdrm, 1 bath
	HUD	$26,000	2 bdrm, 1 bath
	HUD	$21,000	2 bdrm, 2 baths
	HUD	$9,500	1/3 bdrm, 1 1/2 baths
	HUD	$8,000	4 bdrm, 1 bath
	HUD	$39,000	3 bdrm, 1 1/2 baths, 17 acres
June 19, 1988	VA	$2,000 cash	2 bdrm, 1 bath
	HUD	$26,000	2 bdrm, 1 bath
	HUD	$21,000	2 bdrm, 2 baths
	HUD	$9,500	1/3 bdrm, 1 1/2 baths
June 26, 1988	VA	$2,000 cash	2 bdrm, 1 bath
	HUD	$26,000	2 bdrm, 1 bath
	HUD	$9,500	1/3 bdrm, 1 1/2 baths

Source: Billings Gazette, Billings, Montana.

Personal interviews were conducted with local Roundup realtors to obtain estimates of housing availability. According to area realtors, there were approximately 60 homes listed for sale in and around Roundup (Sandy Sysum, Realtor, Floberg Realty, Roundup, Montana. Personal communication, June 25, 1988; Robert McLeod, Realtor, Wagon Wheel Real Estate, Roundup, Montana. Personal communication, June 27, 1988; Susie Churchill, Realtor, XL Realty, Roundup, Montana. Personal communication, June 27, 1988).

The Billings Board of Realtors Multiple Listing Service (MLS) has over 500 realtors (or approximately 90 percent of all area realtors) listing homes through the service. By year-end 1988, there were 3,408 residential listings with MLS and in January and February 1989, there were an additional 441 new listings in and around the Billings area (Laura Klein, Billings Board of Realtors Multiple Listing Service, Billings, Montana. Personal communication, March 13, 1989).

Mobile Home Parks

Mobile home courts, campgrounds, and recreational vehicle (RV) and tent parks in Montana are required by law to be licensed by the Montana Department of Health and Environmental Sciences (DHES), Food and Consumer Safety Bureau. A list of licensed mobile home courts is prepared by DHES that provides the name of the park owner, address, and number of licensed spaces by category (i.e., recreational trailers, tents, cabins, and mobile homes). Because the DHES list cannot be used for the purpose of unsolicited telephone calls (e.g., surveys), owners of the mobile home parks on the list could not be contacted to gather such information as rental fees, number of vacancies, and occupancy rates. Based on this DHES list, there are 68 mobile home lots and three RV lots in the Roundup area (Table 3.32).

Two mobile park owners were interviewed concerning number of trailer spaces for rent, occupancy rate, and monthly rental fees (Table 3.33). Monthly rental fees ranged from $70 to $75, excluding electricity. (Note: Sources other than the DHES list were used to obtain the names of park owners; thus, interviews were conducted with the owners to obtain information concerning specifics of the parks.)

Of the 40 mobile home lots in the two courts, 12 were occupied by permanent residents (Cindy Tull, Manager, Ideal Motel and Trailer Court, Roundup, Montana. Personal communication, June 24, 1988; Trish and Kirt Christensen, Owners, Highland Trailer Court, Roundup, Montana. Personal communication, June 27, 1988).

In the Billings area, there are at least 2,812 licensed mobile home spaces and 149 RV spaces (Table 3.32). The largest court provides lots for 482 mobile homes as well as temporary spaces for 18 RVs.

Housing Units For Rent

In June 1988, a reconnaissance housing inventory was conducted within the Roundup area by driving the city streets. For Sale signs and apartment complexes were counted within the defined survey area. Although three apartment complexes were identified during the inventory (Santa Fe Apartments, Roundup

TABLE 3.32

NUMBER OF LICENSED MOBILE HOME COURT SPACES — ROUNDUP AND BILLINGS AREAS

Mobile Home Courts	*Number of Licensed Spaces*	
ROUNDUP AREA		
Mini Court #1	3	
Mini Court #2	2	
Enterprise Sales/Rent	4	
Hi Land Trailer Park	25	
Ideal Motel Trailer Court	19	
Riverside Trailer/Campground	2	(+3 RV spaces)
Star Apartments Trailer Court	7	
Wall's Trailer	6	
Total Mobile Home Spaces	68	
Total RV Spaces	3	
BILLINGS AREA		
Agri Center Subdivision	3	
Allen Mobile Home Court	9	
Atlantic Trailer Court	11	
B & C's Court	11	
Bauer's Court	4	
Becraft Mobile Home Park	27	
Belknap Trailer Court	12	
Big Sky Trailer Court & Campground	NA	
Billings KOA Kampground	NA	
Birch Mobile Court	11	
Blain's Mobile Home Court	219	
Billings Realty Mobile Home Park	8	
Blue Creek Trailer Court	14	
Broadmoor Trailer Court	18	
Broken Spoke	52	
Bud's Trailer Court	5	
C & C Mobile Court	60	
C & D Mobile Court	16	(+1 RV space)
C & M Rentals	6	
Canary Lane Court	9	
Capri Mobile Home Court	19	
Carrie Lynn Estates	92	
Casa Village	482	(+18 RV spaces)
Cleveland Trailer Court	4	
Clyde's Trailer Court	6	
Country Lane Mobile Court	27	
Cozy Court Trailer Park	6	
Custer Avenue Trailer Court	3	
D-J Mobile Home Court	5	
Dalke Trailer Court	5	
Davis Court	4	
Don's Mobile Home Park	21	
Drifka/Krug Trailer Park	7	
Duck Creek Trailer Court	30	
East Gate Mobile Village	27	
Eastwood Estates Trailer Court	36	
Emerald View Park	102	
Florine Trailer Court	9	
Garden Avenue Campground	115	RV spaces
Gauger's Sales Corp.	37	
Glentana Mobile Home Court	84	
Golden Meadows Mobile Home Park	194	
Green Acres Mobile Court	20	
Happy Acres Trailer Court	20	
Hoffman Trailer Court	4	
Hole's Court	7	
Holmes Trailer Court	10	
Howard Lee Trailer Court	2	

TABLE 3.32 (Continued)

NUMBER OF LICENSED MOBILE HOME COURT SPACES — ROUNDUP AND BILLINGS AREAS

Mobile Home Courts	*Number of Licensed Spaces*	
Humphrey Mobile Home Court	13	
J & E Trailer Court	5	
J.B.'s Court	4	
J & J Court	5	
King's Rest Mobile Home Manor	18	
Kramer's Court	11	
Kraske Mobile Home Lot	6	
L & G Trailer Court	10	
Lake Elmo Mobile Home Park	30	
Lakeside Mobile Home Park	8	
Lyndes Trailer Court	3	
Marvin's Mobile Home Court	10	
North Park Village	28	(+2 RV spaces)
Piccolo Lane Mobile Court	3	
Pine Court	24	
Pine View Court	48	
Polar Row	6	
Preble Trailer Court	3	
R & R Trailer Court	13	
Ray Weber Trailer Court	5	
Restad Trailer Court	5	
Rimrock Village Mobile Home Park	40	
River Grove Estates	52	
River Park Mobile Court	56	
Ryder's Trailer Court	10	
Sage View Village	56	
Saveway Trailer Court	12	
Ser Sco Way Mobile Court	16	
Shiloh Village Mobile Home Park	14	
Smith Trailer Court	4	
South Frontage Road Trailer Court	4	
Southgate Village Mobile Park	60	
Sunset Mobile Home Court	49	
Susie Trailer Court	6	
Susie Trailer Court #2	8	
T & J Court	5	
Taylor's Trailer Court	14	
Three "S" Trailer Spaces	4	
Trailer Village	62	(+13 RV spaces)
Triangle J Trailer Court	8	
Triple E Mobile Court	12	
Washington Court	2	
Western Trails Motor Court	16	
Wilkerson Trailer Court	4	
Windsor Park	213	
Woodland Court	31	
Yellowstone Baptist College Trailer Court	6	
Roslien Trailer Court	7	
4 C L Estates	25	
Total Mobile Home Spaces	2,812	
Total RV Spaces	149	

NA = Not available

Source: Montana Department of Health and Environmental Sciences, Food and Consumer Safety Bureau, Helena, Montana, 1988.

TABLE 3.33

SELECTED CHARACTERISTICS OF MOBILE HOME PARKS IN ROUNDUP

Mobile Home Park	*Number of Spaces*	*Rent*	*Comments*
Ideal Motel & Trailer Court	15	$70/month + electricity	Full hookups. One permanent resident.
Highland Trailer Park	25	$75/month + electricity	Full hookups. Three of the 25 spaces would only be suitable for smaller trailers. Eleven permanent residents.

Sources: Personal communication with Cindy Tull, Manager, Ideal Motel and Trailer Court, Roundup, Montana (June 24, 1988) and Trish and Kirt Christensen, Owners, Highland Trailer Court, Roundup, Montana (June 27, 1988).

Apartments, and Tri-County Housing), there did not appear to be any major apartment complexes in the city. However, there may be small apartment buildings such as duplexes and triplexes nestled within the residential area.

During the six-month monitoring period of the Roundup Record-Tribune, two other apartment complexes were identified-Home on the Range and Rose Apartments. Similar to the Tri-County Housing Apartment complex, Home on the Range is set aside for the elderly.

The Rose Apartments have nine apartments available for rent to the general public, ranging in size from one to two bedrooms with monthly rental charges from $100 to $225, plus electricity. According to the apartment complex owner, within the past one to two years, they have had difficulty in maintaining full occupancy due to limited demand (Don Rose, Owner, Rose Apartments, Roundup, Montana. Personal communication, March 1, 1989). In March 1989, only three of the apartment units were rented.

There was an average of four homes listed for rent during the six-month monitoring period of the newspaper. Rent ranged from $90 to $300 a month. In addition, an average of three apartments and one mobile home were listed for rent (Table 3.30).

Local realtors reported that although there are a relatively large number of housing units for sale, rental homes and apartments are scarce. The number of rental units could increase, however, if out-migration due to poor economic conditions in the area continues and more homeowners are forced to rent their unsold homes (Robert McLeod, personal communication, June 27, 1988).

Motels

Interviews were conducted with three operators of motels in Roundup to determine number of motels rooms, number of kitchenettes, and room rates of the motels (Table 3.34). Overnight rates for one person ranged from $21.84 to $24.96 a night. There were a total of 61 rooms in the three motels, with eight of the rooms equipped with cooking facilities.

TABLE 3.34

SELECTED CHARACTERISTICS OF MOTELS IN ROUNDUP

Motel	*Number of Rooms*	*Nightly Charge*	*Comments*
Ideal Motel & Trailer Court	10 units	$21.84/1 person/ night ($87.36/week for 1 person).	Eight units are kitchenettes
Big Sky Motel	22 units	$24/1 person/ night	No special rates for weekly or monthly stays.
Sage Motel	29 units	$24.96/1 person/ night	Special rates for weekly/monthly stays negotiated.

Sources: Personal communication with Mike McCleary, Manager (temporary), Big Sky Motel, Roundup, Montana (June 24, 1988) and Chris Neidhardt, Owner/Manager, Sage Motel, Roundup, Montana (June 24, 1988).

In the Billings area, there are 2,720 rooms in 38 motels licensed by DHES, Food and Consumer Safety Bureau. Because of the abundance of the number of available motel rooms, interviews were not conducted with motel operators.

Transportation

DEFINITION OF TRANSPORTATION STUDY AREA

The study area for transportation includes state and county highway systems within the southern portion of Musselshell County and the northern portion of Yellowstone County (Figure 3.1). More specifically, major highways include U.S. Highway 87 from the intersection of U.S. Highway 12 south to the intersection of U.S. Highway 312 (the Huntley Road); Old Divide Road; and U.S. Highway 312 (Huntley Road) from the intersection of U.S. Highway 87 northeast to the Huntley railroad siding.

MODES OF TRANSPORTATION

Railway transportation is nonexistent in Musselshell County. The closest freight rail services from the proposed land exchange area are in Broadview (Golden Valley County) and Huntley (Yellowstone County).

Commercial transportation is available through Intermountain Transportation Company. The bus offers a daily service in Roundup in the morning originating from Billings, and in the late evening originating from Great Falls.

There is a public airport for light aircraft 1.2 miles from Roundup. The Roundup airport has a 5,100 foot, hard surface, lighted runway. The nearest commercial air service is about 50 miles from Roundup at the Logan International Airport in Billings.

ROAD AND BRIDGE CONDITIONS

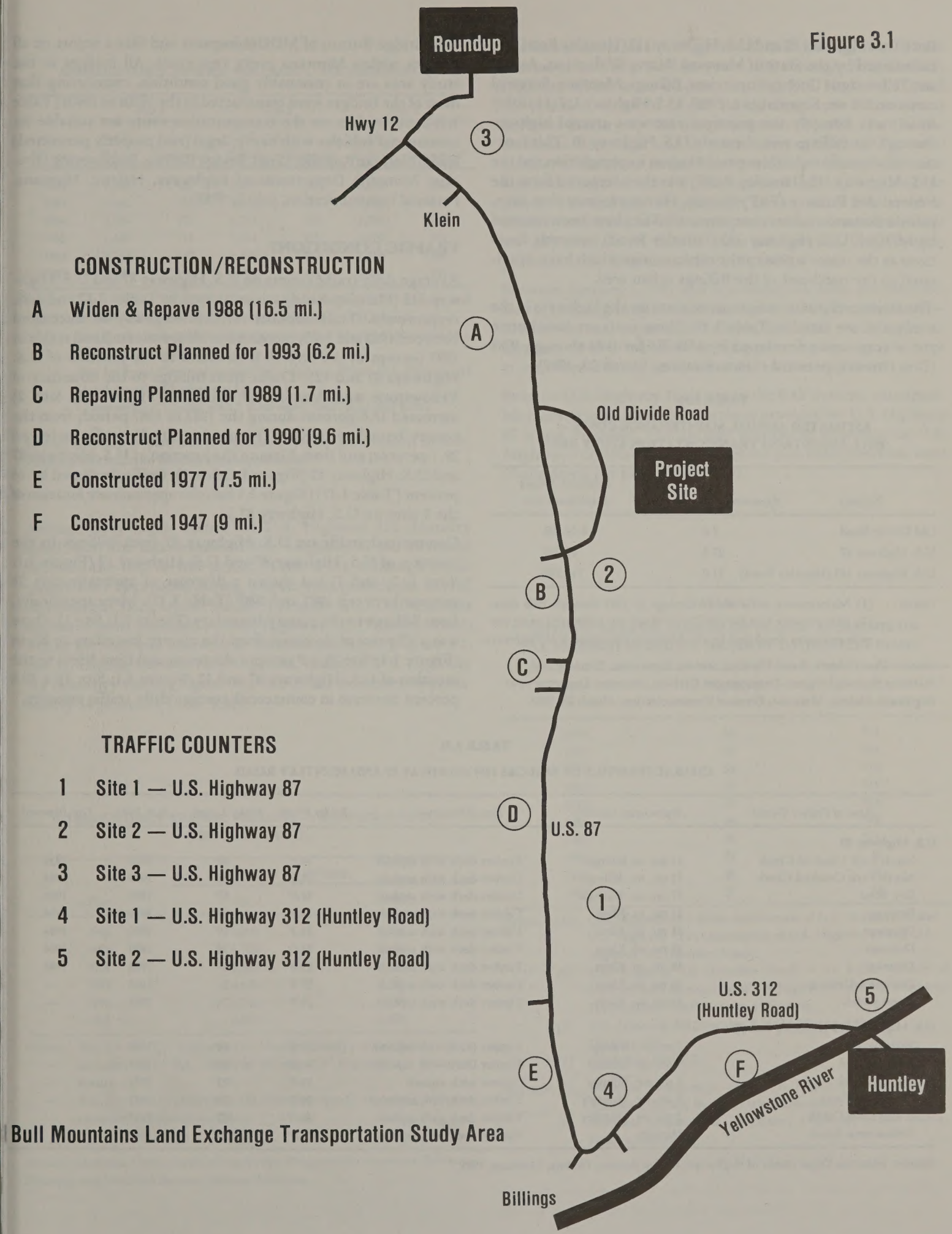
The Federal lands are accessible from the north and south by U.S. Highway 87. U.S. Highway 87 is a two-lane, paved road that connects U.S. Highway 12 (near Roundup) to the Billings area. One county road (Old Divide Road) provides access to the project site directly. Old Divide Road is a two-lane, paved road, makes an approximate seven-mile loop to the east off of U.S. Highway 87 and is under the jurisdiction of Musselshell County. Several private, two-track trails traverse the project area and are used primarily by ranchers for access into the area.

The Montana Department of Highways (MDOH) evaluates the surface conditions of the State-maintained roadways every two years through the Pavement Management System. The pavement condition or "distress rating" is one factor that is used to identify locations of highways that may need repair or improvement. The pavement condition rating system is measured on a scale from 1 to 40 points with the best possible rating for this evaluation being 40 points.

The distress rating of U.S. Highway 87 as of August 1988 was 27 points for that part of the highway from the junction of U.S. Highway 87 and U.S. Highway 312 (Huntley Road-K-Mart corner) north for 7.5 miles and a four-mile stretch of the highway 20 miles north of the junction (K-Mart corner). The remainder of U.S. Highway 87, between the Old Divide Road and the junction of U.S. Highway 87 and U.S. Highway 312 (K-Mart corner), was rated 15 to 16. The projected repaving and reconstruction of U.S. Highway 87 (Figure 3.1) would most likely raise the distress ratings of this roadway to levels near 40 points from the current ratings of 15 and 16 (Don Cromer, Rural Planning Section Supervisor, Planning and Statistics Bureau, Program Development Division, Montana Department of Highways, Helena, Montana. Personal communication, March 20, 1989).

The pavement conditions of U.S. Highway 312 (Huntley Road) were somewhat higher than U.S. Highway 87, ranging from 38 to 40 points near the junction with U.S. Highway 87 (K-Mart corner) to 28 points for nine miles east of the junction (K-Mart corner). These relatively high ratings reflect a maintenance seal coat project completed within a year of when the pavement was rated.

Figure 3.1



Bull Mountains Land Exchange Transportation Study Area

Both U.S. Highway 87 and U.S. Highway 312 (Huntley Road) are maintained by the State of Montana (Harry Wolverton, Assistant Yellowstone County Supervisor, Billings, Montana. Personal communication, September 6, 1988). U.S. Highway 312 (Huntley Road) was formerly the principal east/west arterial highway through the Billings area, formerly U.S. Highway 10. This function was transferred to Interstate 94 upon its completion and the U.S. Highway 312,(Huntley Road) was then removed from the Federal-Aid Primary (FAP) System. However, since that time, jurisdiction and maintenance responsibilities have been retained by MDOH. U.S. Highway 312 (Huntley Road) currently functions as the major access to the communities which have developed to the northeast of the Billings urban area.

The estimated annual maintenance costs for the highways in the study area are listed in Table 3.35. These costs are based upon the average costs developed by MDOH for 1984 through 1988 (Don Cromer, personal communication, March 20, 1989).

TABLE 3.35

ESTIMATED ANNUAL MAINTENANCE COSTS — BULL MOUNTAINS TRANSPORTATION STUDY AREA

Highway	*Approximate Miles of Road*	*Estimated Annual Maintenance Cost*
Old Divide Road	7.0	$ 19,398
U.S. Highway 87	27.5	84,060
U.S. Highway 312 (Huntley Road)	11.0	112,220

Notes: (1) Maintenance costs are an average of 1984 through 1988 data.
(2) Maintenance cost for Old Divide Road was estimated using per mile estimates developed by the Montana Department of Highways.

Source: Don Cromer, Rural Planning Section Supervisor, Planning and Statistics Bureau, Program-Development Division, Montana Department of Highways, Helena, Montana, Personal Communication, March 20, 1989.

The Bridge Bureau of MDOH inspects and files a report on all bridges within Montana every two years. All bridges in the study area are in reasonably good condition, considering that most of the bridges were constructed in the 1930s or 1940s (Table 3.36). All bridges on the transportation route are suitable for commercial vehicles with heavy, legal (and properly permitted) loads (Norman Rognlie, Chief, Bridge Bureau, Engineering Division, Montana Department of Highways, Helena, Montana. Personal communication, July 5, 1988).

TRAFFIC CONDITIONS

Average daily traffic counts on U.S. Highway 87 and U.S. Highway 312 (Huntley Road) are presented in Tables 3.37 and 3.38, respectively. Traffic counts on U.S. Highway 87 fluctuated between 1982 and 1985, increased in 1986, and remained stable in 1987 (except in the stretch from Klein to the junction of U.S. Highways 87 and 12). Traffic from Billings to the boundary of Yellowstone and Musselshell counties (Figure 3.1; Site 2) increased 18.6 percent during the 1982 to 1987 period; from the county boundary to Klein (Figure 3.1; Site 2), traffic increased 29.1 percent; and from Klein to the junction of U.S. Highway 87 and U.S. Highway 12 (Figure 3.1; Site 3), traffic decreased by 14 percent (Table 3.37) (Figure 3.1 lists the approximate location of the 3 sites on U.S. Highway 87.)

Commercial traffic on U.S. Highway 87 from Billings to the junction of U.S. Highway 87 and U.S. Highway 12 (Figure 3.1; Sites 1, 2, and 3) has shown a decrease of approximately 24 percent between 1982 and 1987 (Table 3.37). More specifically, from Billings to the county boundary (Figure 3.1; Site 1), there was a 17 percent decrease; from the county boundary to Klein (Figure 3.1; Site 2), a 9 percent decrease; and from Klein to the junction of U.S. Highways 87 and 12 (Figure 3.1; Site 3), a 39.6 percent decrease in commercial average daily traffic volumes.

TABLE 3.36

CHARACTERISTICS OF BRIDGES ON HIGHWAY 87 AND HUNTLEY ROAD

Name of Feature Crossed	*Approximate Location*	*Type of Structure*	*Bridge Width*	*Bridge Length*	*Year Built*	*Year Improved*
U.S. Highway 87						
South Fork Crooked Creek	13 mi. no Billings	Timber deck with asphalt	24.6′	58′	1930	1954
North Fork Crooked Creek	13 mi. no. Billings	Timber deck with asphalt	24.5′	58′	1930	1954
Dry West	17 mi. no. Billings	Timber deck with asphalt	24.5′	57′	1930	1954
Drainage	21 mi. so. Klein	Timber deck with asphalt	24.5′	58′	1930	1954
Drainage	21 mi. so. Klein	Timber deck with asphalt	24.3′	59′	1930	1954
Drainage	19 mi. so. Klein	Timber deck with asphalt	24.5′	38′	1930	1954
Drainage	18 mi. so. Klein	Timber deck with asphalt	27.0′	57′	1930	1948
Stockpass-Drainage	16 mi. so. Klein	Timber deck with asphalt	27.2′	21′	1930	—
Razor Creek	16 mi. so. Klein	Timber deck with asphalt	28.0′	75′	1955	—
U.S. Highway 312 (Huntley Road)						
Fivemile Creek	3 mi. ne. Billings	Timber Deck with asphalt	30.0′	65′	1947	—
BBWA Canal	4 mi. ne. Billings	Timber Deck with asphalt	30.0′	69′	1947	—
BBWA Canal	5 mi. ne. Billings	Culvert with asphalt	39.5′	22′	1973	—
Sevenmile Creek	5 mi. sw. Huntley	Timber deck with asphalt	30.0′	25′	1947	—
Twelvemile Creek	2 mi. sw. Huntley	Timber deck with asphalt	30.0′	102′	1947	—
Yellowstone River	Huntley	Timber deck with asphalt	28.0′	1024′	1949	—

Source: Montana Department of Highways, Bridge Bureau, Helena, Montana, 1985.

TABLE 3.37

AVERAGE DAILY TRAFFIC VOLUMES — U.S. HIGHWAY 87

	Site 1		Site 2		Site 3	
Year	All Vehicles	Commercial	All Vehicles	Commercial	All Vehicles	Commercial
1982	1,506	182	1,377	166	2,070	250
1983	1,440	172	1,521	182	1,865	223
1984	1,579	192	1,553	189	1,925	234
1985	1,449	131	1,491	135	1,700	154
1986	1,760	167	1,658	157	1,960	186
1987	1,786	151	1,777	151	1,780	151

Notes: Site 1 = From Billings city limits to the boundary of Yellowstone and Musselshell counties (total stretch of highway = 20.2 miles).
Site 2 = From boundary of Yellowstone and Musselshell counties to Klein (total stretch of highway = 21.0 miles).
Site 3 = From Klein to Junction U.S. Highway 87 and U.S. Highway 12 (total stretch of highway = 1.8 miles).
Commercial = Trucks with 2 axles and 6 tires (dual rear tires).

Source: Montana Department of Highways, Program Development Division, Planning and Statistics Bureau, Helena, Montana.

Average daily traffic counts on U.S. Highway 312 (Huntley Road) near the intersection of U.S. Highway 87 has increased between the 1982 to 1987 period (Table 3.38). Although traffic counts have fluctuated during this six-year period, the overall increase was 33.2 percent for Site 1 (Figure 3.1). Traffic counts also have been recorded on U.S. Highway 312 (Huntley Road) where the highway crosses the Yellowstone River (Figure 3.1; Site 2). During the 1984 to 1987 period, traffic on U.S. Highway 312 (Huntley Road) (Figure 3.1; Site 2) has decreased approximately 14 percent (Table 3.38).

TABLE 3.38

AVERAGE DAILY TRAFFIC VOLUMES — U.S. HIGHWAY 312 (HUNTLEY ROAD)

	All Vehicles	
Year	Site 1	Site 2
1982	5,060	NA
1983	6,120	NA
1984	5,860	1,980
1985	6,070	1,800
1986	5,700	1,920
1987	6,740	1,700

Notes: Site 1 = On U.S. Highway 312 (Huntley Road) a short distance from intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road).
Site 2 = On U.S. Highway 312 (Huntley Road) where the highway crosses the Yellowstone River.
NA = Not available.

Source: Montana Department of Highways, Program Development Division, Planning and Statistics Bureau, Helena, Montana.

Traffic accidents on U.S. Highway 87 and U.S. Highway 312 are presented in Table 3.39 for years 1979 through 1988. On U.S. Highway 87, between the junction with U.S. Highway 312 and the junction with Old Divide Road, there were 173 accidents between January 1, 1983 and September 30, 1988. Two of the accidents were fatal and 88 were injury accidents. The total number of fatalities in this time period was five and the total number of injuries was 153. The accident rate during this time period was 1.65 per vehicle mile driven, while the accident severity rate was 1.564. This compares to the statewide accident severity rate of 1.51 for the same time period (Don Cromer, personal communication, March 20, 1989).

Between January 1, 1983 and September 30, 1988, the intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road—K-Mart corner) experienced eleven accidents resulting in six injuries, three of which were incapacitating injuries. No large trucks were directly involved in any of these accidents.

Because U.S. Highway 312 is not on the FAP System, a comparable analysis of accident rates to those provided for U.S. Highway 87 is not available. The average number of accidents for U.S. Highway 312 (Huntley Road) over the past three years has been 21 accidents per year (Table 3.39).

TABLE 3.39

HISTORIC DATA ON NUMBER OF TRAFFIC ACCIDENTS ON U.S. HIGHWAY 87 AND U.S. HIGHWAY 312 (HUNTLEY ROAD)

Year	U.S. Highway 87	U.S. Highway 312 (Huntley Road)
1979	55	NA
1980	50	NA
1981	56	NA
1982	54	NA
1983	45	NA
1984	46	NA
1985	48	NA
1986	32	19
1987	28	21
1988	25	23

Notes: (1) U.S. Highway 87 = From intersection of U.S. Highway 87 and U.S. Highway 12 to intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road).
(2) U.S. Highway 312 (Huntley Road) = An 8-mile stretch of highway from intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) to town of Huntley.
(3) U.S. Highway 312 (Huntley Road) 1988 data is through October 1988.
(4) NA = Not Available

Sources: (1) Montana Department of Justice, Highway Patrol Division, Accidents Record Bureau, Helena, Montana.
(2) Montana Department of Justice, Highway Traffic Safety, Helena, Montana.

SCHOOL BUS TRANSPORTATION ROUTES

Six school systems operate buses that transport school children on the proposed coal haul route; Roundup School, Shepherd School, Pioneer School, Billings Junior High School, Billings Senior High School, and Huntley Project School. Roundup School buses travel both U.S. Highway 87 (south to the boundary of Musselshell and Yellowstone counties) and the Old Divide Road. Shepherd School buses travel both U.S. Highway 87 and U.S. Highway 312 (the Huntley Road). Pioneer School buses travel U.S. Highway 312. Billings Senior High School has a bus route on U.S. Highway 87, while Billings Junior High School uses U.S. Highway 312 (Huntley Road) as a bus route. Buses for the Huntley Project School also travel on U.S. Highway 312 (Huntley Road) (into Huntley) to pick up and drop off students.

Table 3.40 presents the 1988/89 schedule of school district bus routes applicable to the study area and the times that they would be on the proposed haul route. Most of the bus interaction with trucks on the haul route would be in the area of U.S. Highway 312 (Huntley Road) from U.S. Highway 87 into Huntley. Although these schedules are somewhat consistent from year-to-year, they may change depending on pickup points. For example, the Shepherd School bus that travels on U.S. Highway 87 currently does not go to the county line to pick up students; however, in the future there may be school-aged children in the area requiring bus transport services.

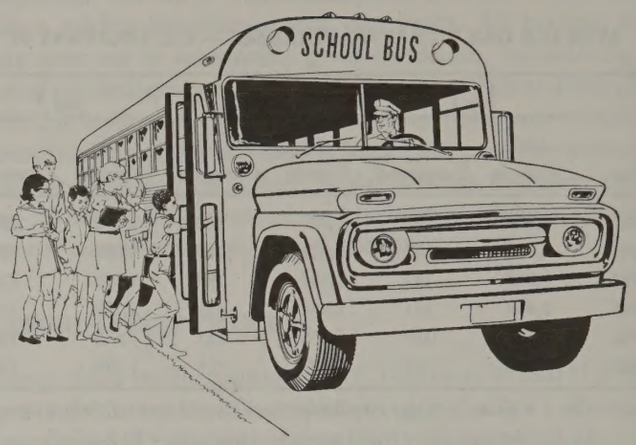
Peak use for the U.S. Highway 312 (Huntley Road) school buses is from 7:15 to 8:30 in the mornings and from 3:15 to 4:30 in the afternoons. It should be noted that at least two of the school districts (Shepherd and Pioneer schools) may have buses leaving in the afternoon up to one hour earlier than the schedule listed in Table 3.40 on at least one day of the week because students are excused from school earlier on those days.

TABLE 3.40

INTERACTING SCHOOL BUS ROUTES —
BULL MOUNTAINS STUDY AREA

School District	*Bus Route*	*Highway*	*Interacting Time* *A.M.*	*P.M.*
Roundup #55	Southern	Old Divide Road/ U.S. 87	7:25-8:00	4:15-4:50
Huntley Project #24	Huntley	U.S. 312	6:50-7:15	3:30-4:15
Shepherd #37	#1	U.S. 312	7:35-7:50	3:45-4:15
Shepherd #37	#2	U.S. 312	7:25-7:50	3:45-4:15
Shepherd #37	#3	U.S. 312	7:45-8:00	3:45-4:00
Shepherd #37	#8	U.S. 87	7:20-7:50	3:55-4:25
Shepherd #37	#9	U.S. 312	7:50-8:00	3:45-3:55
Pioneer #41	#1	U.S. 312	7:50-8:10	3:50-4:00
Pioneer #41	#2	U.S. 312	7:40-8:25	3:20-4:10
Billings #2	#9	U.S. 312	7:00-7:15	3:25-3:40
Billings #2	#3	U.S. 312	7:30-7:50	4:00-4:20

Source: Personal communications with staff from various school districts.



Air Quality

CLIMATE

The project area is located approximately 13 miles south of Roundup and 35 miles north of Billings in both Musselshell and Yellowstone Counties in the Bull Mountains of central Montana. The area is characterized by rolling hills covered by pine trees and sagebrush. The country slopes to the south and east into the Yellowstone River drainage.

The annual average precipitation ranges between 12 to 14 inches (three-fourths of which falls during the April to September growing season) which is adequate for many types of grains and grasses. The average precipitation at the nearest National Weather Service station (Broadview) is 12.62 inches. Wintertime precipitation is light, averaging only 1.14 inches. May and June experience the greatest amount of precipitation with a combined total of 4.63 inches.

Temperature extremes in the area can be great with the warmest average temperatures recorded in July (71.8° Fahrenheit (F)) and coldest average temperatures recorded in January (21.7° F). The average annual temperature is 46.9° F and the frost-free season is 120 to 130 days.

Wind data in the study area is scarce. However, data collected over a ten-month period in 1981 indicated no predominant wind direction. Northerly winds were the most common. Average wind speeds were light averaging 3.5 miles per hour.

AIR QUALITY

The study area for air quality is located in an area of previous mining activity. However, the mining was small scale. The two active coal mines in the area produced a total of 32,244 tons of coal in 1984. Primary existing sources of air pollution are wind blown soils (wind erosion), vehicle traffic on unpaved roads, wood burning, and slash burning. The area is considered as attaining the Federal and Montana ambient air quality standards. The area is also classified as a Class II area under the Federal Prevention of Significant Deterioration regulations, allowing moderate growth. The nearest Class I area is located approximately 75 miles north-northeast in the U.L. Bend Wilderness within the Charles M. Russell National Wildlife Refuge.

Air quality measurements were made in 1981 for total suspended particulate matter (TSP) at three locations at the PM Mine (formerly the Bull Mountains Coal Company). The measurements of TSP were made for eleven months, from February through December, 1981. The maximum TSP concentration recorded was 107 micrograms per cubic meter ($\mu g/m^3$). This is compared to the Federal secondary standard at that time of 150 $\mu g/m^3$. The Federal particulate standards have now been changed to measure only 10 micron or smaller particulates (PM-10). The maximum geometric average TSP concentration measured for the eleven months was 23.6$\mu g/m^3$. This is compared to the old Federal secondary standard of 60 $\mu g/m^3$. No measurements of PM-10 particulates have been made in the area. However, the TSP measurements made in 1981 were also well within the PM-10 standards and as such, the PM-10 concentrations should be lower and within the standards. The present Federal and Montana particulate standards are shown in Table 3.41.

TABLE 3.41

AMBIENT AIR QUALITY STANDARDS
FOR SUSPENDED PARTICULATES
(Values in micrograms per cubic meter)

Time Period	*Montana PM-10*	*Federal PM-10*
24-Hour	150*	150*
Annual	50+	50+

*Not to be exceeded more than once per year.

+Arithmetic average of the quarterly averages.

SOURCE: Gelhaus, James M., February 1989.

Areas of Critical Environment Concern (ACEC)

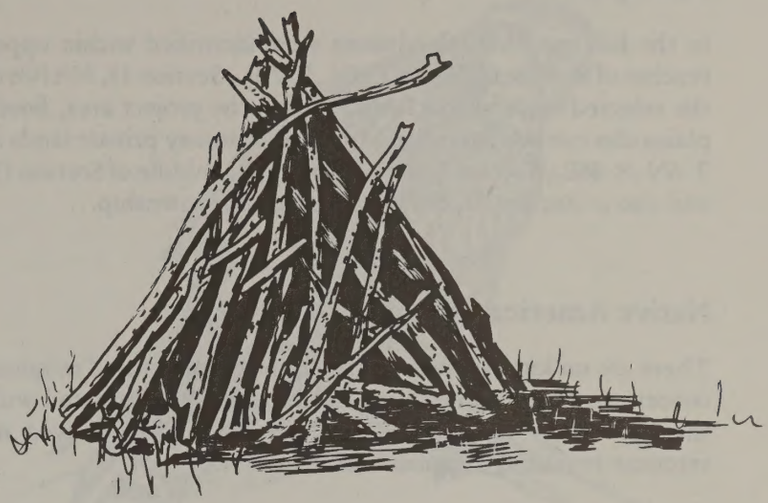
Within the affected area there are no known areas of critical environmental concern. The possibility of a surface ACEC occurring on BLM surface ownership is remote because BLM administers very little surface in the project area (719.72 acres).

Cultural Resources

Two major inventory efforts have occurred within the project area. The first effort, conducted by the BLM to Class III standards for resource planning, covered 8.7 percent of the selected federal coal lands. A total of five cultural properties were recorded within two 160 acre blocks. This permits a projection of one property for each 64 acres, or a total of 57.4 cultural properties within the selected Federal coal lands.

Three lithic scatters, one aboriginal wooden structure, and two historic graffiti panels were found within these inventoried areas. Five additional aboriginal wooden structures and one historic cabin site were found during access to the inventoried blocks.

The second effort was conducted by a private consulting firm for a proposed mine plan. Areas inventoried to BLM Class III standards consisted of mine portal development areas of private surface within the project area. On the selected Federal coal lands, non-intensive inventory was performed to provide information on impacts to cultural resources in buffer zone areas. A total of nine sites were recorded during this effort. These sites consisted of four historic homestead sites, one prehistoric rock art site, and four historic graffiti panels.



In 1984 the area was engulfed by the Hawk Creek wildfire. All standing wooden structures were destroyed by the fire. None of the aboriginal wooden structure sites have been relocated since this event.

The existing inventory information indicates a fairly intensive prehistoric utilization of the surface above the coal lands. Abundant porcellanite reserves provided raw materials for stone tool manufacture. The pine breaks ecozone was important winter game habitat. The complex and elevated topography provided for solitude and viewshed characteristics important to prehistoric Native American religious practices.

Historic utilization of the area was also intense. As early as 1881, the coal reserves of the area were recognized as important and initial mining development was made by the Northern Pacific Railroad for their own coal needs. Transportation problems from the mine to the railhead made this early development infeasible at the time. In 1884 Township 6N, Range 27E was summarized as being ". . . believed to contain more coal than any other in the Bull Mountains Field . . ." (Woolsey, et al., 1917) Prospect work in the area began again in 1914.

After 1900, settlers began to homestead within the project area. Both grazing and agricultural lands were available. These were supplemented by income opportunities for logging and small coal mine operations. Most efforts were successful and only 19.6 percent of the patented land reverted to the Federal government through the provisions of the Bankhead-Jones Act. All Federal lands within the project area were patented during the homestead period.

Agriculture (Farm and Grazing)

The selected lands are currently used for livestock grazing and have no farmland (agricultural) potential.

Floodplains

In the Billings RMP, floodplains were identified within upper reaches of Rehder Creek in T.6N.,R.27E., Section 18, N½ N½ of the selected Federal coal lands. Within the project area, floodplains also exist on Meridian Minerals Company private lands in T.6N.,R.26E., Section 7, SW¼ through the middle of Section 17, and also in Section 13, SW¼ all in the same township.

Native American Religious Concerns

There are no known areas on the subject coal lands of religious concern to Native Americans. Consultation was initiated with the Crow tribe in June 1988. As yet, BLM has received no response regarding religious concerns.

Threatened and Endangered Species

The three endangered species that could potentially occur in the project area include the bald eagle, peregrine falcon and the black-footed ferret. Though an occasional bald eagle may be seen migrating through this area, none of these three species are known to occur on or make current use of the project area.

Hazardous Wastes

There are no known hazardous wastes or landfill sites within the project area.

Wetland-Riparian Zones

There are no wetland or riparian areas in the Federal coal lands or within the project area.

Wild and Scenic Rivers

There are no proposed or designated wild and scenic rivers within the project area, nor are there any drainages that drain the project area that feed into a wild and scenic river.

Wilderness

There are no proposed or designated wilderness areas within the project area. The wilderness qualities of the area are low because of off-site and some on-site activities such as an adjacent highway, a major county road and coal mining activity.

Topography and Soils

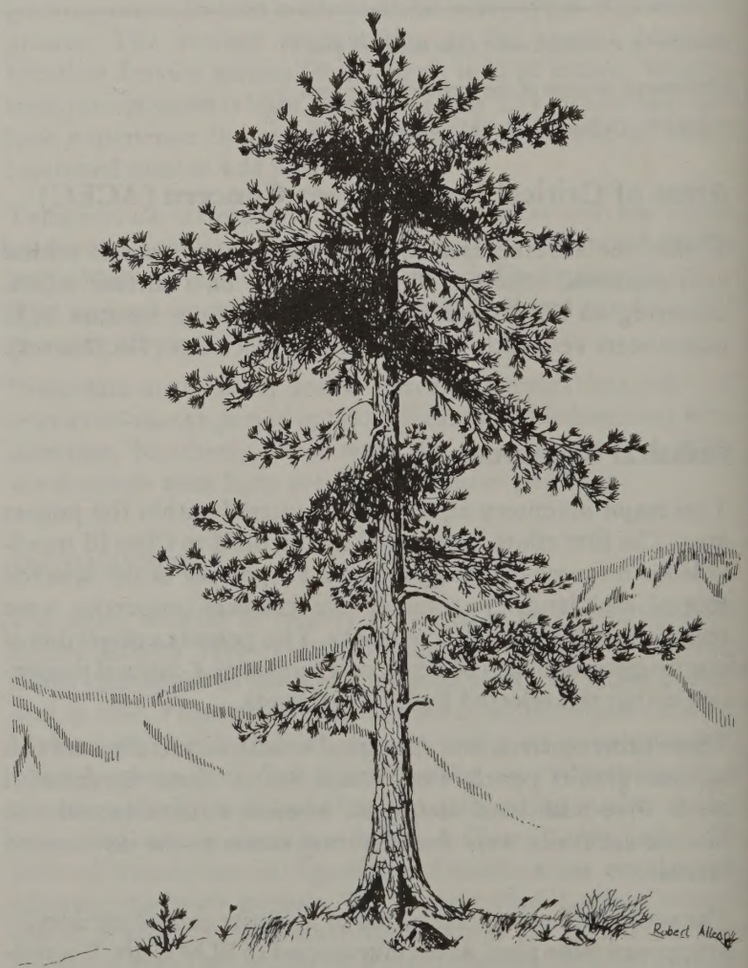
The soils are derived from the Tongue River member of the Fort Union geologic formation. This member is composed of interbedded sandstone, siltstone, shale and coal beds as thick as 80 feet. The soils consist of mainly well-drained loams and sandy loams over weathered sandstone, siltstone and shale. Depths range from shallow to deep. Permeability is moderate and the hazard from wind and water erosion is moderate to severe.

These soils are used primarily to produce grassy vegetation for grazing. The main management concerns are wind and water erosion, very low available water capacity and slope.

The sandstone and silty-shale bedrock has been dissected into narrow, smooth-topped ridges that are separated by deep, narrow coulees and dry stream valleys. Large, thick masses of sandstone outcrop on the sides of the coulees and valleys. The most prominent features of the landscape are the vertical ledges of sandstone 20 to 50 feet thick. The larger stream valleys contain thick alluvial deposits that surround knolls and hills. The drainageways are tributaries of the Yellowstone River. Elevation ranges from 3500 to 5000 feet.

Vegetation

The vegetation, of the project area consists of 50 percent Ponderosa pine forest with Rocky Mountain juniper. Shrubs consist of skunkbush sumac while grasses consist of little bluestem, bluebunch wheatgrass, sideoats grama and Western wheatgrass. The remaining 50 percent of the area is dominated by grasslands composed primarily of little bluestem, green needlegrass, bluebunch wheatgrass, prairie sandreed, big bluestem, prairie junegrass and bluegrama.



Wildlife

GAME SPECIES

The project area provides habitat for a variety of game and non-game species of wildlife. The primary vegetative type in this area prior to 1984 consisted of a Ponderosa pine overstory and a shrub/grass/forb understory.

In 1984, a wildfire burned through the area and created substantial changes in the habitat available to both game and non-game wildlife species in the area. The most apparent effect of the fire was the removal of much of the Ponderosa pine overstory which resulted in the release of the forb/grass understory. Grass and forb production has increased dramatically as a result of this event. The elk, mule deer, antelope and wild turkeys in the area have responded to this situation by making increased warm-season use of this abundant forage resource. A negative impact of the fire was the removal of the Ponderosa pine overstory and the loss of thermal and escape cover for the local elk and mule deer populations as well as roosting cover for the turkey population.

Prior to the 1984 fire, mule deer and elk used the area during the winter months and at other times of the year when escape cover was needed. Both the elk and mule deer have had to seek thermal and escape cover on private lands to the east of the proposed exchange area since the fire. Though white-tailed deer, sharp-tailed grouse and pheasants occur in the general area, they are not known to occur on the subject coal lands (Dusek, 1978).

NON-GAME SPECIES

A wide variety of non-game mammals and birds occur in the Bull Mountains area. A non-game mammal study was conducted in the general area in 1976 (McCann, 1976). As has been the case with the big game animals that occurred in this area, the 1984 fire has had a secondary positive effect on non-game species in the burned-over area. The return of the vegetative cover to an earlier seral stage has been beneficial to a host of small non-game mammals as well as some non-game bird species.

Woodcutters have removed many of the larger fire-killed Ponderosa pine trees in the area, thereby reducing the availability of nesting habitat for large non-game birds such as hawks and owls. However, there will likely be an increase in habitat for smaller cavity nesting species such as flickers and woodpeckers.

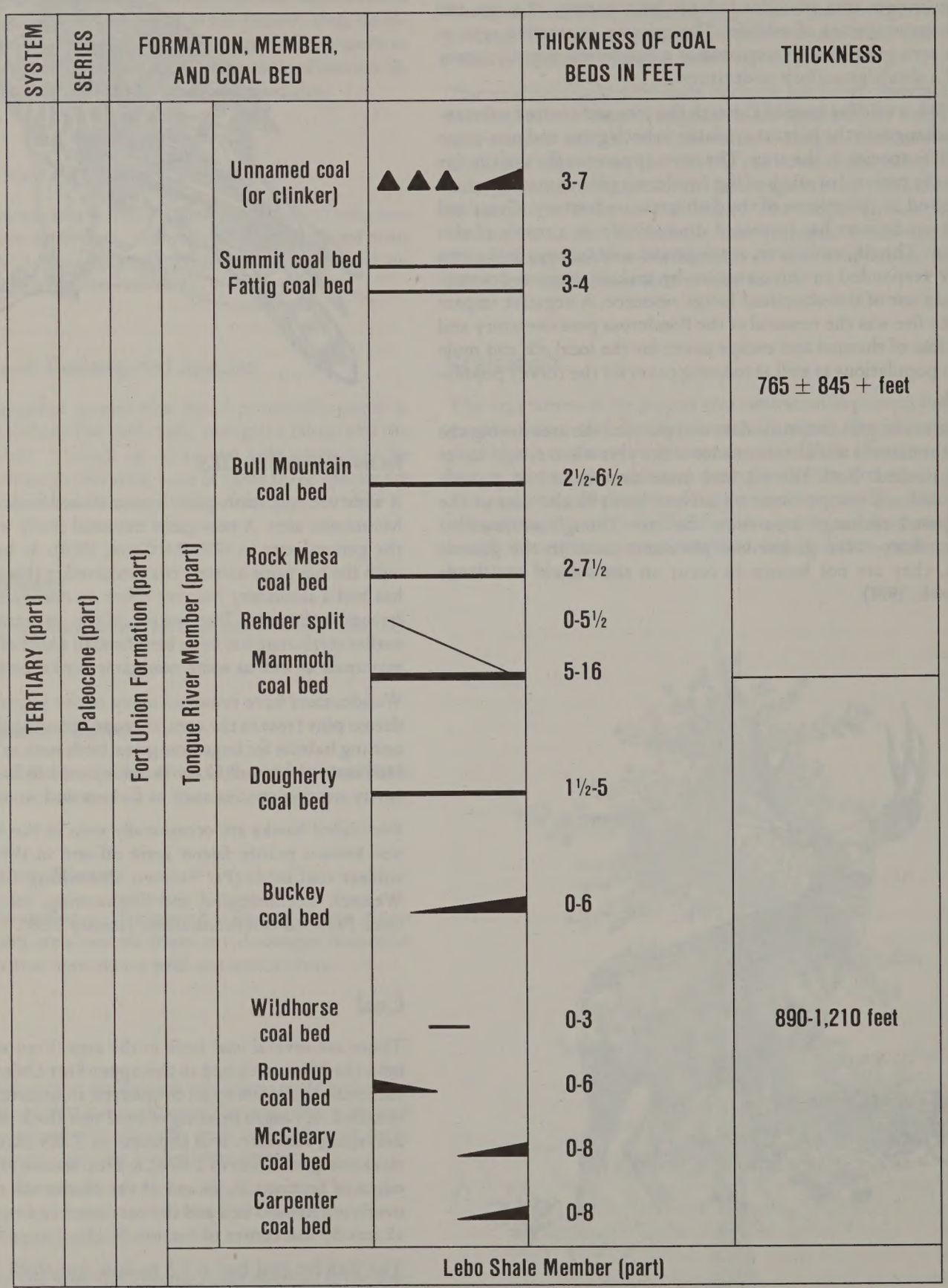
Red-tailed hawks are occasionally seen in the area and there is one known prairie falcon aerie off-site in the vicinity of the subject coal lands (Pat Farmer, Consulting Wildlife Biologist, Westech Technological and Engineering, Inc., Helena, Montana. Personal communication, January 1989).

Coal

There are several coal beds in the area (Figure 3.2). However, only the Mammoth bed in the upper Fort Union formation is of sufficient thickness to be considered an underground mineable resource. It ranges from eight to 15 feet thick in the study area, averaging 10.2 feet. It is thinnest in T.6N.,R.26E., Section 25, thickening to 11 feet in T.6N., R.27E, Section 33. On the eastern edges of Sections 21, 28 and 33 the Mammoth merges with the overlying Rehder bed and the combined bed rapidly thickens to 15 feet by the center of Section 34.

The Rehder coal bed is 1.5 to four feet thick throughout the study area. The parting between the Rehder and the Mammoth beds is 40 feet or more in the western half of the Bull Mountains area.

Figure 3.2 — Stratigraphic position of the Mammoth coal bed and other relatively persistent coal beds in the Bull Mountain coal field.



Source: Connor, 1988

Quality analyses for the Mammoth bed in the project area, based on samples from 27 sites, are:

	Average	*Range*
Btu/lb	9640.00	8970 to 10200
Moisture %	17.65	16.57 to 20.29
Ash %	10.20	6.93 to 13.88
Volatile Matter %	29.68	27.77 to 32.35
Fixed Carbon %	42.12	39.27 to 45.00
Sulfur %	.87	.50 to 01.22

Other Minerals

OIL AND GAS

The Bull Mountains lie on the southern edge of the Bull Mountains basin. Oil is developed in the Melstone area approximately 20 miles north of the project area. There are three dry wells in the vicinity of the project area. Given the presence of oil and gas bearing formations and the fact that all possible horizons were not tested in the three dry wells, the project area has been classified as having moderate oil and gas development potential (United States Department of the Interior, Bureau of Land Management, Miles City District Oil and Gas Amendment, in press). There is no known current active interest in the area for oil and gas development.

MINERAL MATERIALS

Within the project area there are several deposits of clinker. Clinker (also known as scoria) is the baked and fused rock which resulted from the inplace burning of coal deposits. Clinker is used as road surfacing material on a local basis. Due to the relative remoteness of the area and the ready availability of clinker and gravel for road surfacing in the Bull Mountains area, the clinker is of little significance. It may be useful to local ranchers and for any roadwork done in conjunction with mine development.

LOCATABLE MINERALS

There are no known deposits of locatable minerals or mining claims within the area.

Hydrology

GROUNDWATER

Hydrogeologic Setting

The project area (Map 6) lies within that portion of the Bull Mountains basin defined by surface outcrops of the Fort Union formation of Paleocene age, specifically the Tongue River member. This member consists of consolidated sediments ranging from light-buff to dark-gray shaley siltstones and shales, brown to black carbonaceous shales, and coal beds. Locally, coal outcrops have burned out with associated baking of overlying sandstones and shale to form clinker.

Locally, the affected portion of the Bull Mountains basin consists of a very flat-limbed syncline (1° to 2° dips) that plunges gently to the northwest (Map 7). Higher elevations in central portions of this structure are capped by mesa-like outcrops of clinker beds up to 80 to 90 feet thick. Otherwise, the hydrogeologic setting is dominated by highly dissected terrain underlain by discontinuous sandstone lenses, bounded by siltstones and shales, and relatively thin coal seams. The stratigraphic sequence is basically the same in the Bull Mountains area (Figure 3.3) as it is regionally throughout eastern Montana.

Hydrostratigraphy

Several hydrogeologic units of this formation have regionally been defined as aquifers and generally yield significant quantities of water to both wells and springs (Hotchkiss and Levings, 1986). Three aquifers overlie the thick impermeable Bearpaw shale unit of the Bull Mountains basin and other portions of the Powder River basin Fort Union Coal Region (Figure 3.3). In ascending order these are:

Fox Hills-Lower Hell Creek Aquifer — composed of the Fox Hills sandstone and the lower part of the Hell Creek formation. This aquifer yields water in most areas, generally less than 100 gallons per minute to wells, but occasionally greater than 200 gallons per minute locally. Yields of 20 gallons per minute are common.

Tullock Aquifer — composed of the basal channel sandstone of the Lebo shale member, where present, and the Tullock member of the Fort Union formation. Because of its stratigraphic position between thick shales, the Tullock aquifer is hydrologically confined. Yields in both sandstones and coals range as high as 40 gallons per minute, but 15 gallons per minute is more common.

Tongue River Aquifer — composed of the Tongue River member of the Fort Union formation. It also includes channel sandstones of the upper Lebo shale member where present. This unit is the uppermost of the post-Bearpaw shale aquifer system of eastern Montana and is considerably thicker than underlying units. Generally it is hydrologically confined except near the surface. In spite of highly variable thicknesses and poor horizontal continuity, thick saturated sandstones of the unit have yielded as much as 160 gallons per minute in other areas. The thinner, lens-like distribution of sands of the Tongue River member in the Bull Mountains area limits yields to the 15 to 30 gallons per minute range. Coal seams of the Tongue River member, like those of the Tullock member, have good yield potential in favorable situations.

In the Bull Mountains area, wells and springs tend to be confined to the Tongue River member because of its thickness and the 1000 to 2000+ feet depths required to tap deeper aquifers. For this reason, development of deeper aquifers has not been undertaken except at near-surface outcrop locations having limited recharge potential. Lack of data precludes adequate evaluation of these deeper units within more central portions of the Bull Mountains basin, but based on other similar geologic configurations, substantial quantities of water might be yielded by deep drilling in central areas of the basin.

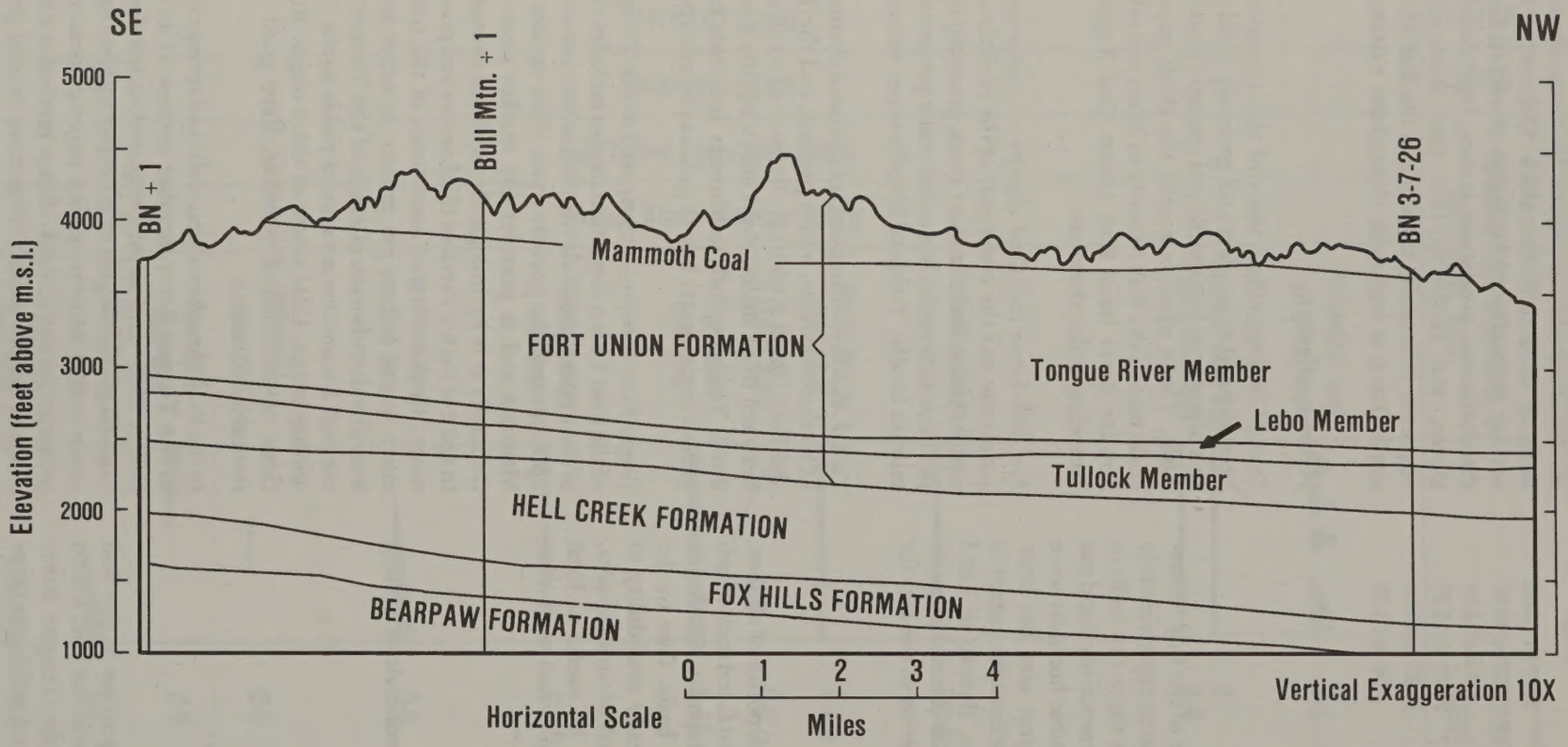


Figure 3.3 — Geologic cross section through the Bull Mountains area. Formation and member contacts based on Integrity Oil and Gas Company wells (names shown above wells); Mammoth coal occurrence based on numerous shallow exploration holes not shown on section. Section is approximately along the axis of a broad, gently plunging syncline. (Source: Thompson, 1982)

Recharge

Primary groundwater recharge of shallow hydrogeologic units in the southern portion of the Bull Mountains basin results from surface infiltration of precipitation.Because of the flat-lying nature of stratigraphic units, such infiltration tends to be limited to the uppermost exposed horizon of the Tongue River member, in this case the 80 to 90 feet of clinker beds forming the mesa-like cap of Dunn Mountain (Map 7). Elsewhere, exposure to precipitation of permeable sandstones are limited by their cliff-like outcrops. Slopes of the highly dissected Bull Mountains terrain also tend to be underlain by siltstones and shales, and thus are more conducive to runoff than to infiltration.

In the absence of a major losing stream system, total recharge for the southern portion of the Bull Mountains project area results from snowmelt and precipitation. Deeper sandstones are recharged primarily by leakage from overlying sand lenses, in spite of losses from the latter by outflow where they intersect the surface.

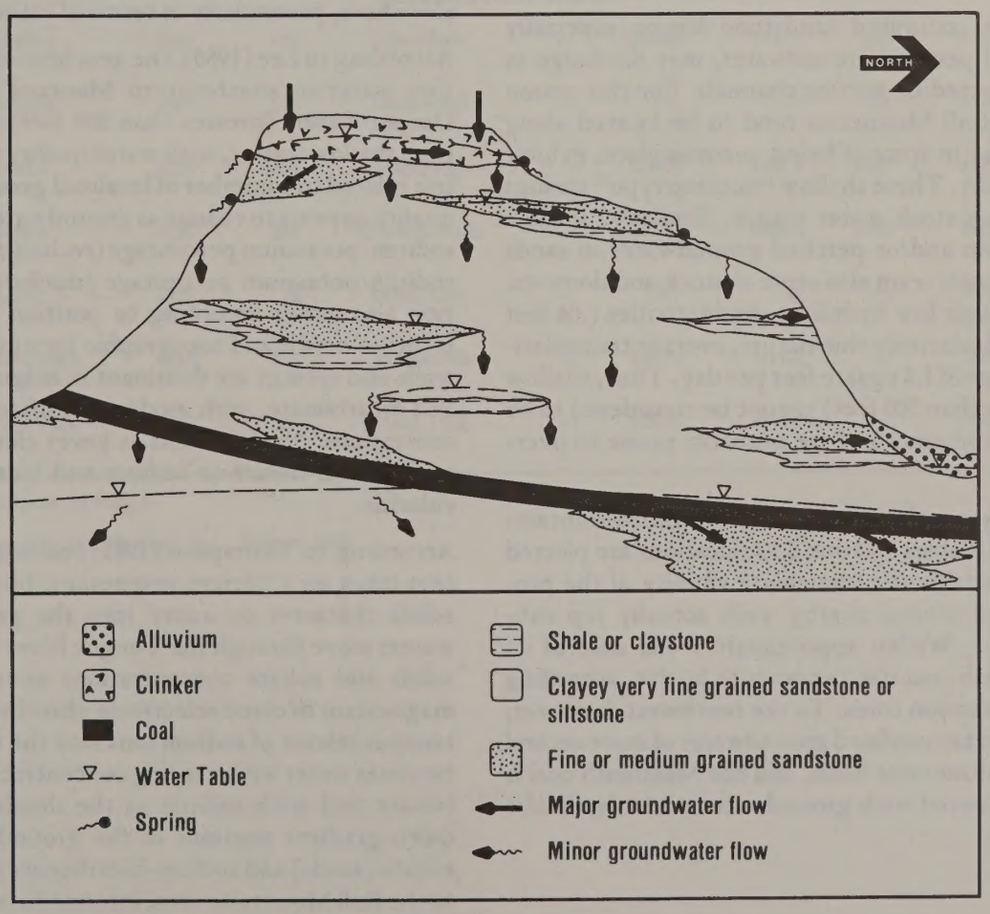
Groundwater Flow

Flow of shallow groundwater in the Bull Mountains is highly dependent on recharge, which in turn is dependent on infiltration from snowmelt and precipitation. Hydraulic conductivities of the Mammoth coal and of sandstones above and below the coal range from .002 to 2.9 feet per day. Such variability makes it difficult to predict flow rates with a high degree of certainty, although worse case scenarios may be determined with confidence.

Seasonal and annual fluctuations in precipitation strongly control the magnitude of groundwater recharge of the Tongue River aquifer. As a result, springs and possibly wells may be affected, with flow irregularities being the rule rather than the exception, especially in the case of perched zones above the Mammoth coal. The more confined nature of deeper units results in less seasonality of flow due to the added potential for pressure release of stored waters under potentiometric head conditions and from the larger recharge area involved.

Figure 3.4 schematically represents local groundwater flow in the Bull Mountains. Precipitation infiltrates primarily into the clinker beds which act as a temporary storage reservoir. Slow downward movement through less permeable strata ultimately feeds confined sand lenses so that multilevel, perched water systems are created. Where surface channels intersect these sands, springs occur. Vertical permeability variations tend to complicate the general downward migration of groundwater, but the net result is recharge to a regional system. Locally, flow may be interrupted by topographic irregularities resulting in springs and diversion of infiltrating waters to shallow alluvial systems.

Figure 3.4 — Schematic diagram illustrating ground-water flow in the Bull Mountains area. (Source: Thompson, 1982)



Based on available well data, the groundwater gradient for the Mammoth coal has been determined (Map 8). In general, flow is to the northwest, much as would be predicted for a northwest plunging synclinal structure. Pre-mining flow of deeper confined groundwater thus tends to be away from outcrops and toward the center of the Bull Mountains basin under strong influence of regional stratigraphy and structure.

Discharge

Groundwater discharge in the Bull Mountains area generally takes two forms. Seepage of groundwater from sand lenses and/or perched systems above the Mammoth coal seam occurs in the form of springs at the intersections of topographic channels with such zones. This is basically unconfined discharge and is severely limited by recharge conditions. This discharge also temporarily recharges channel alluvium locally, but downstream groundwater in alluvium may either infiltrate back into bedrock or contribute to perennial stream flow through surface discharge.

Except for near outcrop areas, the deeper system is characterized as semi-confined or confined. As flow continues downward and laterally into central portions of the Bull Mountains basin, groundwater can be discharged only by deep well release or by upward hydraulic flow to surface streams outside the project area, depending on geologic conditions and/or local pressure differentials.

Wells and Springs

As stated previously, saturated sandstone lenses, especially those with associated perched groundwater, may discharge as springs where intersected by surface channels. For this reason most springs in the Bull Mountains tend to be located along drainage bottoms, and in spite of being commonplace, exhibit high seasonal variability. These shallow "outcrop type" springs are the most common stock water source. Similarly, shallow wells tapping alluvium and/or perched groundwater in sands above the Mammoth coal seam also serve as stock and domestic sources. Because of their low hydraulic conductivities (.04 feet per day average), and relatively thin nature, average transmissitivities are in the range of 1.1 square feet per day. Thus, shallow wells in the area (less than 300 feet) cannot be considered to be good groundwater producers and are probably prone to overpumping.

Characteristics of major springs and wells of the Bull Mountains area, are tabulated in Tables 3.42 and 3.43; locations are plotted in Map 6. Most lie outside the immediate vicinity of the proposed mine area, and several nearby wells actually tap sub-Mammoth sandstones. Within approximately one mile of its outcrop, the Mammoth coal itself appears to be dry, according to test wells and exploration cores. To the northwest, however, deeper wells appear to tap confined groundwater of more central portions of the Bull Mountains basin, and the Mammoth coal is considered to be saturated with groundwater under hydraulic head.

SURFACE WATER/DRAINAGE SYSTEMS

No major stream system is present in the Bull Mountains; the nearest perennial stream of consequence is the Musselshell River, approximately 18 miles to the northwest. Major surface drainage of the area is by intermittent surface runoff via ephemeral channels. Most surface drainage is northward via upper reaches of Rehder and Fattig Creeks. Southeasterly drainage is provided by Pompeys Pillar and Railroad Creeks (Map 6), although only ephemeral tributary channels of their upper reaches lie within the area to be impacted by mining. No designated alluvial valley floor situations are present within the project area in association with any of these drainages.

WATER QUALITY

Water quality analyses (Table 3.44 and 3.45), collected from both wells and springs of the Bull Mountains area, indicate that groundwater chemistry is diverse but tends to reflect location in the flow system, aquifer mineralogy, and time of aquifer contact. Specific conductances range from 500 to 3000+ micro mhos per centimeter (μ mhos per cm), the median value being approximately 2000 μ mhos per centimeter. This appears to compare favorably with lower concentrations associated with sodium-bicarbonate waters of the deeper Fox Hills-lower Hell Creek aquifer rather than the higher concentrations commonly associated with the Fort Union formation of eastern Montana (Montana Bureau of Mines and Geology (MBMG) and USGS, 1978, Special Publication 80). Otherwise, water quality of springs and wells in the Bull Mountains is typical of Fort Union water elsewhere, particularly in terms of cation/anion concentrations.

According to Lee (1980), the geochemistry of Fort Union formation water in southeastern Montana is of a dual character. Deeper waters (greater than 200 feet) tend to be less variable than shallow waters, with water quality in general being more or less related to a number of localized geochemical cells. Chemical quality appears to change as groundwater flows from areas of low sodium/potassium percentage (recharge areas) to areas of higher sodium/potassium percentage (discharge areas), but composition also varies according to position in the system, both in terms of depth and topographic location. At higher elevations, wells and springs are dominant in magnesium, calcium, sodium and bicarbonate, with moderate sulfates and low chloride concentrations. Shallow wells at lower elevations are dominant in sodium and sulfate or sodium and bicarbonate with increased chloride.

According to Thompson (1982) recharge water from precipitation takes on a calcium-magnesium-bicarbonate, low-dissolved solids character on entry into the groundwater system. As waters move through the Tongue River member, total dissolved solids and sulfate concentrations increase while calcium and magnesium become selectively absorbed into clays with simultaneous release of sodium ions into the water. The end product becomes water with varying concentrations of sulfate and bicarbonate and with sodium as the dominant cation. In deeper, down-gradient portions of the groundwater system, sodium-sulfate (sands) and sodium-bicarbonate (coals) waters dominate. In the Bull Mountains area, intermediate compositions appear to be the most common.

TABLE 3.42

BULL MOUNTAIN
WELL INVENTORY DATA

Well No.	*Legal Location*	*Ground Elevation*	*Depth of Well (ft)*	*Aquifer*	*Discharge (gpm)*	*Depth to Water*	*Water Elevation*	*Mammoth Elevation*	*Comments*
				PRIVATE WELLS					
PW-001	5N 27E 6 NW4NW4	3868	250	Sub-Mam.	—	—	3868.0	—	
PW-002	5N 27E 6 NW4SE4	3825	120.50	Sub-Mam.	8	24.80	3801.0	—	From Quad Map
PW-003	6N 26E 12 SW4NE4	3850	132	Sub-Mam.	5	71.10	3778.9	3790	Log/SS aquifer 105-114
PW-004	6N 26E 13 SW4SW4	3890	200	Sub-Mam.	12	7 .00	3815.0	3885	Aquifer at 200 ft
PW-005	6N 26E 13 SW4NE4	—	250.96	—	12	200.00	—	—	
PW-006	6N 26E 24 Center	3940	206	Sub-Mam.	32	—	—	—	Sandstone and clay aquifer
PW-007	6N 26E 35 NE4SE4	3734	50	Sub-Mam.	10	30.00	3704.0	—	
PW-008	6N 26E 36 SW4SW4	3720	—	Sub-Mam.	—	33.00	3687.0	—	
PW-009	6N 26E 36 SW4SE4	3720	—	Sub-Mam.	—	—	3720.0	—	
PW-010	6N 26E 36 NW4NW4	—	75	Sub-Mam.	2	75.00	—	—	Sandstone aquifer below surface gravel
PW-011	6N 27E 7 SW4NE4	3940	—	Sub-Mam.	20	47.30	3892.7	3740	
PW-012	6N 27E 7 SW4SW4	3970	190	Mam. O.B.	1	146.00	3824.0	3788	
PW-013	6N 27E 11 SW4NE4	3900	100	Sub-Mam.	5	63.00	3837.0	3824	
PW-014	6N 27E 11 SW4SW4	4077	443	Sub-Mam.	4	115.00	3692.0	3802	
PW-015	6N 27E 11 SE4NW4	—	200	—	5	110.00	—	—	Log/Mammoth not present
PW-016	6N 27E 18 SW4NW4	4035	190	Mam. O.B.	1	4 .00	3990.0	3812	
PW-017	6N 27E 19 NW4SW4	4030	360	Sub-Mam.	3	173.50	3856.5	3915	
PW-018	6N 27E 30 SW4	—	250	—	8	—	—	—	Water table reported at 150 ft
PW-019	6N 27E 31 NW4SE4	3963	170	Sub-Mam.	12	1.70	3911.3	—	Perforations 130-170
PW-020	6N 27E 32 SW4SW4	3900	85	Sub-Mam.	—	65.90	3834.1	—	
PW-021	6N 27E 34 SE4SW4	3982	270	Sub-Mam.	—	189.60	3792.4	—	Exploration hole temporarily used
PW-022	6N 27E 35 SW4NE4	3980	195	Sub-Mam.	—	153.70	3826.3	—	
				OBSERVATION WELLS					
OW-001A (BM8A)	6N 26E 24 SW4SE4	4065	170	Sub-Mam.	—	156.86	3908.1	393	MBMG Observation Well 8A
OW-001B (BM8B)	6N 26E 24 SW4SE4	4065	142	Mammoth	—	—	—	3935	MBMG Observation Well 8B (dry)
OW-002A (BM5A)	6N 27E 14 SE4SE4	4325	456	Mammoth	—	424.08	3900.9	3885	MBMG Observation Well 5A
OW-002B (BM5B)	6N 27E 14 SE4SE4	4325	291	SS Mam. O.B.	—	286.62	4038.4	3885	MBMG Observation Well 5B
OW-002C (BM5C)	6N 27E 14 SE4SE4	4325	75	Mam. O.B.	—	Dry	—	—	MBMG Observation Well 5C (dry)
OW-003A (BM4A)	6N 27E 10 NW4NW4	4035	277	Mammoth	—	220.98	3814.0	—	MBMG Observation Well 4A
OW-003B (BM4B)	6N 27E 10 NW4NW4	4035	160	Mam. O.B.	—	123.41	3911.6	—	MBMG Observation Well 4B

NOTE: Well locations are shown on Map 6.

SOURCE: Northern Engineering and Testing, Inc., August 1988.

TABLE 3.43

BULL MOUNTAIN
RECORD OF SELECTED SPRINGS

Spring No.	*Location*	*Altitude of Land Surface (feet)*	*Discharge (gallons per minute)*	*Specific Conductance (umhos/cm) at 25°C*	*Temperature (degrees C)*
SP-001	05N26E01AAA	3760	—	1000	2.0
SP-002	06N27E09DAD	4200	2	2080	13.0
SP-003	06N27E11CAA	3895	—	2930	15.4
SP-004	06N27E14BDC	4380	—	2000	16.2
SP-005	06N27E15AAA	4086	—	1300	15.0
SP-006	06N27E15CBD	4400	0.5	800	12.0
SP-007	06N27E15CCC	4460	2	480	7.8
SP-008	06N27E15DBA	4440	1	410	9.0
SP-009	06N27E17AAA	4090	—	1320	5.8
SP-010	06N27E17ACC	4075	—	770	13.0
SP-011	06N27E20AAB	4160	0.2	2250	2.5
SP-012	06N27E20BCC	4090	—	1400	10.5
SP-013	06N27E21ADD	4440	0.2	850	2.0
SP-014	06N27E21BAC	4270	3	990	7.0
SP-015	06N27E21BBA	4220	2	1510	6.5
SP-016	06N27E21DAD	4465	3	430	3.0
SP-017	06N27E22ABB	4450	3	460	9.2
SP-018	06N27E22ACB	4420	1	380	8.1
SP-019	06N27E22CBC	4490	—	470	8.5
SP-020	06N27E27BAC	4360	0.3	490	6.8
SP-012	06N27E27ACC	4260	0.8	890	10.0
SP-022	06N27E28CBD	4370	—	1305	9.0
SP-023	06N27E28CDD	4480	0.2	780	8.2
SP-024	06N27E29AAA	4260	—	—	—
SP-025	06N27E34ADD	3990	—	1960	10.3

Notes: Many known springs were dry on 8/5/88, due to lack of normal precipitation in the area.

Spring locations are shown on Map 6.

Source: Rioux and Dodge, 1980.

TABLE 3.44

BULL MOUNTAIN
WATER QUALITY DATA FROM SELECTED WELLS

Well No.	*Specific Conductance (umhos/cm) at 20° C*	*pH*	*Temp (°C)*	*Calcium (mg/l)*	*Magnesium (mg/l)*	*Sodium (mg/l)*	*Potassium (mg/l)*	*Bicarbonate (mg/l)*	*Sulfate (mg/l)*	*Calculated Dissolved Solids (mg/l)*	*Sodium Absorption Ratio*	*Aquifer*
					PRIVATE WELLS							
PW-004	2850	7.3	10	270	240	58	7	500	1200	2060	0.6	Sub-Mam.
PW-009	1620		9									Sub-Mam.
PW-012	2510	7.5	8.7	28	14	550	5	440	870	1740	21	Mammoth
PW-014	1350	8	10.5	71	140	46	8.1	480	440	970	0.7	Unknown
PW-017	2600	7.8	8.0	80	60	330	9	370	830	1500	7	Mammoth
PW-019	2400	7.9	11	46	29	470	7	600	660	1580	13	Sub-Mam.
					OBSERVATION WELLS							
OW-001A	2770	7.1	12.5	65	17	570	7.4	800	846	1920	16.2	Sub-Mam.
OW-002A	3010	7.8	11.3	21	6.5	680	7.7	560	1130	2140	33.2	Mammoth

NOTE: Well locations are shown on Map 6.

Modified from Rioux and Dodge, 1980, and Thompson, 1982

TABLE 3.45

WATER QUALITY OF SELECTED SPRINGS

Spring No.	Specific Conductivity (umbos at 25° C)	pH	Temp (°C)	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	SAR	Bicarbonate (mg/l)	Sulfate (mg/l)	Chloride (mg/l)	Calculated Dissolved Solids (mg/l)
SP-009	1450	8	16.5	34	97	150	7	3	740	190	4	1240
SP-012	1400	8	10.5	71	140	46	8	.7	480	440	10	1210
SP-017	500	8	9	46	30	8.6	3	.2	290	11	13	272
SP-023	1350	7.7	7	96	100	22	6	.4	520	250	11	757

NOTE: Spring locations are shown on Map 6.

Source: Rioux and Dodge, 1980

Both dissolved solids and sulfate concentrations of groundwater samples exceed U.S. Environmental Protection Agency 1975 secondary standards for public drinking water supplies, and a few samples contain excess iron, manganese and nitrate (Thompson, 1982). However, on the average these waters can be used for both stock watering and human consumption without harmful effects in spite of its low quality.

Recreation

In the project area, the major recreational activity is hunting, mainly for mule deer with some elk and turkey hunting occurring. These opportunities are limited due to the lack of public land ownership and access. Resistance by private landowners to allow the general public to hunt on their lands is also a limiting factor.

Other activities include cross-country skiing, snowmobiling, hiking and camping but, like hunting, these opportunities are also limited. The potential to increase recreational activity in the area is low, given the large amount of private lands involved.

Stratigraphy and Geology

The coal in the Bull Mountains is in the Fort Union formation (Paleocene). The Lebo shale is the lowest member of the Fort Union to out crop in the Bull Mountains. It consists of dark shales, sandstone, and coal beds. Above the Lebo is the undifferentiated Tongue River member of the Fort Union formation, consisting of light-colored sandstone, shale, and coal. Both units are non-marine deposits.

The area lies in a broad syncline with an east-west axial trend. Regional structure dips 1°to 4°. Locally, the structural trend is a 0.8° northward dip. This changes slightly to a shallow north-northeast plunging syncline in T.6N.,R.27E, Section 17, on the north edge of the project area.

As the structure is relatively level, overburden on the coal rises as a direct function of the topography. This results in a series of narrowly contoured bands of overburden zones rising rapidly from the outcrop.

Existing Subsidence

Underground coal mining in the Bull Mountains became prominent during the period 1906/07 with the completion of the Chicago, Milwaukee, St. Paul and Pacific Railroad. The bull Mountains coal field became one of the major fuel sources for this railroad. The arrival of the railroad also enabled Bull Mountains coal to compete with other coals in the state's industrial coal market. Coal production from the Bull Mountains peaked during the war years 1943 to 1945 when approximately 1.1 million tons were being produced annually from a total of one dozen active mines. Production dropped off dramatically with the advent of diesel powered locomotives (Travis and Turnbull, 1950).

Subsidence damage from previous mining which required repair has been very minimal to date. Approximately 35 projects have been funded by the Abandoned Mine Lands fund and only two involved the repair of "sinkhole" type subsidence (Ben Mundie, Reclamation Specialist, Abandoned Mine and Reclamation Bureau, Montana Department of State Lands, Helena, Montana. Personal communication, 1989). In both cases, the subsidence

occurred over an area where the overburden ranged from 30 to 40 feet thick. The sinkholes were on the order of 20 to 30 feet in diameter and 15 feet deep. See Appendix 5 for further discussion of subsidence.

DATA ADEQUACY

Resource information and data adequacy is discussed in Appendix 10.

Offered Private Lands

As part of Meridian's effort to facilitate the exchange, they made high value recreation and wildlife lands available to BLM for possible acquisition. BLM selected lands from Table 2.2. The top six priority selections and their general locations are shown in Maps 2 through 5.

PRIORITY LANDS NOS.1,2,3 — MADISON COUNTY (697.45 acres)

Current Management

PRIORITY LANDS NO.1 (572 acres)

This tract has legal access from both the north and south on the west side of the Madison River by a primitive county road that is little used. The access is a dedicated county road that has not been maintained and for approximately seven miles is nothing more than a two-track, primitive road. The road maintenance effectively ends at the junction of the Call Road in T7S, R1W, Section 30, NE¼. This tract fronts the Madison River for 3/4 of a mile, and slopes up to a bench overlooking the river and valley. This tract is currently leased for cattle grazing.

PRIORITY LANDS NO. 2 (48 acres)

U.S. Highway 287 bisects this tract. Approximately one acre lies east of the highway; the balance of the tract is between the highway and the Madison River. Currently this tract is leased for cattle grazing. This tract is included in an allotment management plan developed by BLM in 1987.

PRIORITY LANDS NO. 3 (77.45 acres)

This tract is bisected by a BLM road that leads to the West Madison Recreation Area and Wall Creek State Game Range. There are 5.65 acres on the east side of the river; the remainder of the tract is west of the river. This tract is grazed in conjunction with the adjoining private and BLM lands. Main access to the property is south from Ennis via U.S. Highway 287. U.S. Highway 287 is a paved, two-lane highway, with year-around access. The road is maintained by the Montana Department of Highways.

Affected Environment

SOCIOECONOMICS

The conversion of small isolated tracts of private land to public ownership would have no significant impacts on the social or economic conditions of the area. No permanent in-migration or out-migration would accompany the exchange of land ownership; therefore, no new demand for community services would be realized. Similarly, no impacts would be expected on social structure and interaction of the area in the vicinity of the land exchange. Some changes in land use patterns and recreation may accompany the land exchange, but these changes would minimally affect local and regional socioeconomic conditions. The most likely land use changes would be that more dispersed recreation would take place after the land has changed from private to public ownership; or, if the land is rangeland, the cost of leasing grazing rights may change (lessened) due to the exchange.

The three tracts of property being considered for exchange in Madison County are located approximately 20 miles south of Ennis, Montana, along the Madison River. The area is rural with limited available services.

In 1987, property taxes on the three tracts totalled $124.15. Primary economic use of the property is for grazing, with Priority lands No.1 (572 acres) having a grazing capacity of 98 animal units per month (AUMs); Priority lands No.2 (48 acres), a capacity of 10 AUMs; and Priority lands No.3 (77.45 acres), a capacity of 9 AUMs.

The Madison River valley from Quake Lake to Bear Trap Canyon has been heavily subdivided for recreation and vacation homesites. These tracts vary in size from 1 to 40 acres and are intermingled with working cattle ranches. The river is heavily used by fishermen from across the United States from May through October. The big game hunting season in October and November also attracts many people. The influx of these short-term visitors is a revenue-producing source for the town of Ennis and local fishing and hunting guides.

AIR QUALITY

Air quality over these affected lands is Class II.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

These lands are not located in any areas of critical environmental concern.

CULTURAL RESOURCES

Systematic cultural resource inventory of these lands has not been accomplished. Existing inventory, however, indicates three cultural properties will be acquired through the proposed exchange action. All three properties are prehistoric and consist of a stone circle or tipi ring site, cairn site, and a bison drive alignment system.

AGRICULTURE (FARMING AND GRAZING)

None of these lands are classified as suitable for intensive farming. These lands have historically been used for livestock grazing.

FLOODPLAINS

Portions of all three tracts are within the Madison River floodplain.

NATIVE AMERICAN RELIGIOUS CONCERNS

There are no known sites or areas believed to have religious concern to Native Americans.

THREATENED AND ENDANGERED SPECIES

There are no known threatened or endangered plant species on these tracts. Bald eagles, a threatened species, utilize the Madison River as winter habitat, primarily as a foraging area. No suitable roosting or nesting trees occur along the river, although there is potential for cottonwood generation. No other threatened or endangered animal species occur.

HAZARDOUS WASTES

There are no known hazardous waste or landfill sites on these lands.

WETLAND/RIPARIAN ZONES

These tracts have approximately 1.5 miles of riparian habitat along the river. Riparian condition has deriorated as a result of grazing practices. Remnant shrubs include firmleaf willow, slender willow, Bebb willow and water birch; however, these shrubs are declining. The Madison River channel is very resistant to erosion and detachment so channel stability is not a problem. Cherry Creek runs through the entire length of the tract in T8S, R1W, Section 15. This creek has about a ten-foot riparian zone comprised of rushes and sedges; no woody species are present. The Madison River borders the northeastern portion of this tract. The riparian zones of these tracts have very little chance for expansion due to the stoniness of the soils and the limitations of capillary action. All these tracts have infestations of spotted knapweed and Canada thistle particularly along the river.

WILD AND SCENIC RIVERS

The Madison River is not designated as a wild and scenic river, but has been considered for study status as a potential designate to the wild and scenic river system.

WILDERNESS

None of these tracts are being studied for or managed as wilderness.

TOPOGRAPHY AND SOILS

The topography is typical of a level river valley and, in some cases, it rises sharply from 0 to 100 feet to level benchland. The soils are gravelly loam on the lower slopes closer to the river and cobbly sandy loam on the upper benchlands. The slopes range from 0 to 8 percent.

VEGETATION

The vegetation is typical of the Madison River valley, composed of a bluebunch wheatgrass-needle and thread complex in the uplands and usually very narrow bands of willows, sedges and bluegrass along the river.

WILDLIFE

Big Game

The principal big game habitat value is for antelope. Yearlong use is made of Section 15 by about 30 to 50 antelope. Mule deer and white-tailed deer usage is minor due to the deteriorated cover values. Potential for moose winter use exists, given recovery of riparian shrubs.

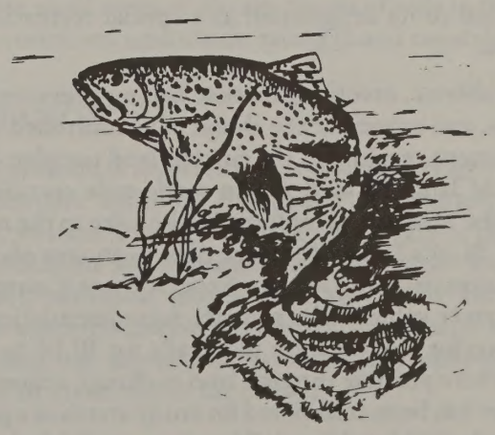
Waterfowl

Canada geese nest throughout the Madison River. Potential for significant nesting use on the tract is minor.

Fisheries

The Madison River is a Class I fishery; also popularly known as a "Blue Ribbon" stream. Trout production on this reach of the Madison is enhanced by sustained flow management from the Montana Power Company regulated Hebgen Lake Dam facility. The productive rainbow trout and brown trout fishery on the Madison River is nationally recognized and intensively utilized. Restrictive sport fishing regulations and cessation of a hatchery fish stocking program have enhanced the quality of this wild trout (sustained by natural reproduction) fishery.

Due to its large size, the Madison River is largely autotrophic. Riparian improvement can enhance trout production and hiding cover values where there is the potential for vegetation overhanging the stream surface, particularly by shrubs.



OTHER MINERALS

Oil and Gas

Oil and gas rights will be reserved by Meridian and will not be transferred.

Mineral Materials/Mining Claims

Sand and gravel deposits exist in substantial amounts throughout the entire Madison River valley. There are no mining claims on the adjacent Federal lands, nor are there any mineral leases or operations on these lands.

HYDROLOGY

Surface Water

The Madison River runs through all three tracts. The only other surface water is a small stream which runs through the entire length of T8S, R1W, Section 15.

Ground Water

The water table is within 100 feet of the surface on all three tracts.

Water Quality

All water meets Montana State water quality standards for both surface and ground water.

RECREATION

The Madison River is a nationally famous, blue-ribbon trout stream and ranks number one statewide, in total fishing days. BLM and Montana Department of Fish, Wildlife and Parks use-surveys show non-resident fishermen account for 50 percent of recorded use along the entire river, and come from 38 states and Puerto Rico. In recent years, use has been estimated to total more than 100,000 visits yearly. The river is a major recreation destination point. Other significant recreational use, such as camping, picnics, etcetera, also occurs due to the river's close proximity to the major travel route between Yellowstone and Glacier National Parks. Approximately 27 percent of the river frontage is in BLM ownership and management, from Quake Lake to the Madison/Gallatin county line. The river corridor's importance led to its designation as a special recreation management area.

Resource problems, involving intense fishing pressure, lack of public access, and especially the threat of uncontrolled subdivision development resulted in the current land use plan decision to study BLM lands located within a one-mile corridor along each side of the Madison River from Quake Lake to the northern boundary of BLM's Dillon Resource Area as an area of concern. The subdivision issue also led to a Federal/State/County effort to preserve river values. The primary recommendation of the resulting corridor preservation plan calls for BLM to acquire river lands where possible through land exchange actions. In the past, the river has been considered for study status as a potential designate to the Wild and Scenic River System. With the exception of the Bear Trap unit of the Lee Metcalf Wilderness, no BLM or other lands along the river are under study for, or are being managed as, wilderness.

STRATIGRAPHY AND GEOLOGY

The subject tracts are located along the Madison River in the central part of the Madison River valley. This area is structurally within the craton, or older basement rocks. Tertiary-Paleozoic rocks occur, in general, as a veneer on these Pre-Cambrian rocks. The tracts themselves are composed entirely of Quaternary alluvium in the form of river terraces along the Madison River.

PRIORITY LANDS NO.4 — Custer County (640 acres)

Current Management

The offered lands lie within Custer County approximately two miles east of the Powder River and some 30 miles east of Miles City, Montana. The nearest public highway is U.S. Highway 12, which lies approximately four miles south of the section. Main access to the property is east from Miles City via U.S. Highway 12. U.S. Highway 12 is a paved, two-lane highway, with year-around access. The road is maintained by the Montana Department of Highways. Public access to the tract is attained by traveling six miles up the county road along the east bank of the Powder River. From here, the traveler turns east along a two track road which crosses private lands and is secured by an easement to the United States. Approximately one-half mile up this route lies the boundary of the existing public lands. The offered lands adjoin a large block of public lands approximately 17 sections in size. To access the offered lands from this point the traveler would have to travel overland from Section 26 of the same township and range to reach the section boundary.

At present, there are no off road vehicle (ORV) designations for the tract which limits overland travel. The land is currently leased for livestock grazing.

Affected Environment

SOCIO-ECONOMICS

Three land exchanges have been completed in this area to bring about the large block of adjacent public lands in its present configuration. These exchanges have consolidated the public lands into three primary drainages: Deep Creek, Coal Creek and Snow Creek. The affected parcel is one of two sections within the Snow Creek drainage which are not administered by BLM. The other section is a State section. The State section is presently under consideration for acquisition through exchange with the Montana Department of State Lands. Although the exchanges have not resulted in a shift of economic use within the geographic area, they have repositioned the public lands into a configuration which allows the general public access and use of these lands, primarily for big game hunting. No rights-of-way or other encumbrances presently exist on the affected lands. The

lands are presently leased from Glacier Park Company by Harding Land and Cattle Company. In 1987, property taxes totalled $164.58. Primary economic use of the property is for grazing, with a grazing capacity of 120 AUMs.

AIR QUALITY

Air quality over the affected lands is Class II.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

No areas of critical environmental concern are located on these lands.

CULTURAL RESOURCES

A limited cultural resource inventory of these lands has been completed and no cultural properties were found. Based on baseline information from inventory of surrounding lands, the possibility of discovering significant properties on these offered lands is good.

AGRICULTURE (FARMING AND GRAZING)

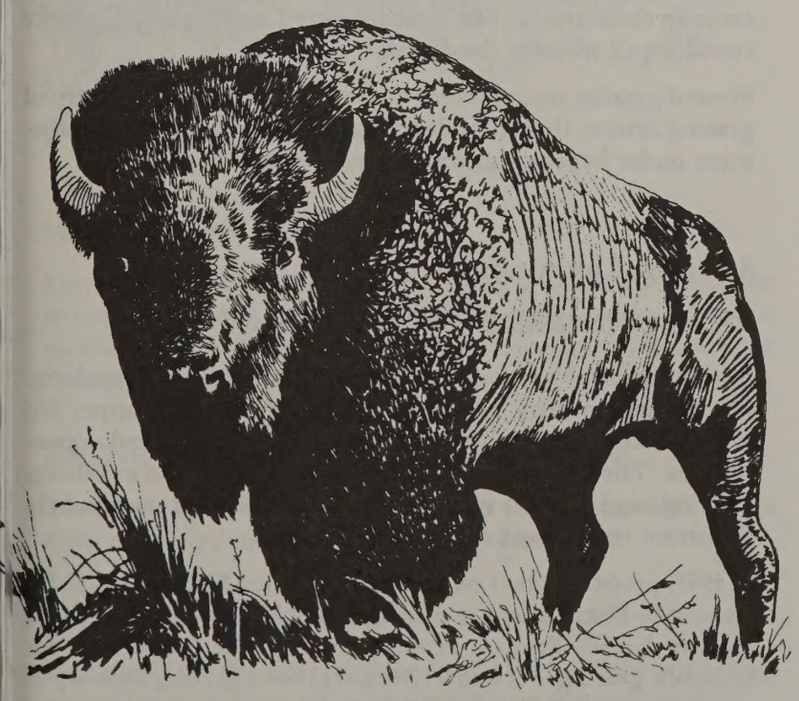
None of these lands are suitable for intensive farming. The affected lands are suitable for grazing only.

FLOOD PLAINS

These lands do not lie within a floodplain.

NATIVE AMERICAN RELIGIOUS CONCERNS

No areas or sites of religious concern to Native Americans are known or likely to exist.



THREATENED AND ENDANGERED SPECIES

There are no known threatened or endangered plant or wildlife species known to occupy the area.

HAZARDOUS WASTES

There are no known hazardous waste or landfill sites on these lands.

WETLAND-RIPARIAN ZONES

The surrounding lands consist of rolling prairie and a section of the Snow Creek drainage. This drainage contains rough breaks topography. Snow Creek is not considered to be riparian in nature.

WILD AND SCENIC RIVERS

No designation of wild or scenic status exist on or near these lands.

WILDERNESS

These lands and surrounding public lands are not being considered or studied for wilderness study area status or managed as wilderness.

TOPOGRAPHY AND SOILS

The general characteristics of the affected parcel can be divided into two general components. The north half of the section, which contains a portion of Snow Creek, generally consists of steep slopes rising from the creek bottom to the adjacent benches on each side. Side drainages running into Snow Creek cut these slopes into rough terrain. The entire section is fenced into and is part of a larger pasture, however, cattle generally congregate either in the creek bottom near available water and forage, or on the adjacent upland benches. The south half of the section primarily consists of an upland bench situated between Snow Creek and Locate Creek. The benchlands in the south half are primarily utilized for grazing. These lands characteristically possess better soils and are more abundant in areas with grassland vegetation. No water sources exist along the bench lands. The soils consist mostly of sandy loams, loams and silt loams. The majority of these soils are rated as range soils, although there are small areas of certain classes of soils in the parcel that have a restricted agriculture rating (Land capability Class III).

VEGETATION

The vegetation is representative of large acreages of southeastern Montana uplands. Bluebunch wheatgrass, needle and thread, western wheatgrass, green needlegrass, blue grama and little bluestem are dominant grasses. Forbs include fringed sagewort, scurfpea, prairie coneflower and vetches. Shrubs include western snowberry, skunkbush sumac, rose, silver sagebrush and big sagebrush. Trees include juniper and a small amount of green ash in the draws.

WILDLIFE

The lands consist of rolling prairie with a vegetative composition of primarily grasses and big sagebrush. This section contains part of the Snow Creek drainage. It contains excellent mule deer habitat and to a lesser extent, antelope habitat. It is considered important winter range for both mule deer and antelope. The rough breaks topography offers plant diversity optimum for deer browsing and offers ample cover for big game wintering.

OTHER MINERALS

Oil and Gas

Oil and gas rights will be reserved by Meridian and will not be transferred.

Mineral Materials/Mining Claims

No known deposits of salable, leasable or locatable minerals are known to exist on these lands. There are no mineral leases, mining claims, material sites, or mineral operations on this tract.

HYDROLOGY

Surface Water

These lands have an ephemeral stream in the northern portion. It is deeply incised and contains a flow only after a precipitation event. Water quality during periods of runoff is poor with high quantities of sediments and sodium present.

Ground Water

The groundwater is limited but it is of adequate quantity to provide well water to a windmill for livestock water. Depth to ground water is normally 250 to 300 feet.

Water Quality

Quality of water is adequate for livestock but is not normally used for domestic purposes.

RECREATION

This tract of land is important to sportsmen because it is adjacent to a large block of public land. Hunting is the primary recreational activity and is generally considered to be excellent. Native game hunting species include mule deer, antelope, predatory and game birds. Other recreational activity includes camping, bird watching, ORV use, rock collecting, trapping and photography.

STRATIGRAPHY AND GEOLOGY

The parcel lies on the contact between the Lebo shale and Tullock members of the Fort Union formation. This is a sedimentary formation with interbedded sandstone, shale, siltstone and coal stratigraphic units occurring throughout most of eastern Montana.

PRIORITY LANDS NO.5 — BEAVERHEAD/ DEER LODGE COUNTIES (1,475.48 acres)

Current Management

Main access to the exchange properties is 15 miles north from Wisdom, Montana via Montana Highway 43. Montana Highway 43 is a paved, two-lane highway, with year-around access. The road is maintained by the Montana Department of Highways. The principal use of this highway is for local access to communities and ranches. Recreation use is heaviest in the summer (fishing) and fall (hunting). The area is rural with limited available services.

T.1N.,R.13W., Sections 17 and 19, have legal public access via Montana Highway 43 and the Big Hole River. T.1N.,R.13W., Section 9, SW¼ has legal access by foot from adjoining National Forest lands. The NW¼NW¼ of Section 9 will not have legal access. A primitive road in Section 17 fords the Big Hole River and provides access to a large area (about 10,000 acres) of the Beaverhead National Forest via Sawlog Gulch.

Current management does not restrict public access. The present owner plans to sell these properties if the lands are not exchanged. Private interest in these lands would tend toward purchase for livestock grazing or a private hunting and fishing area, eliminating public access to these lands and adjacent National Forest lands.

Private ownership of these lands allows for unrestricted timber harvesting. With the even aged, monoculture nature of the existing lodgepole pine stands, existing terrain and road considerations, and current private practices, the entire forested area would probably be harvested upon the initial timber entry. Reforestation depends on the methods used to conduct the harvest and existing conifer seed supplies on the site, as it is unlikely that artificial regeneration treatments would be applied. Harvesting will probably occur in the next 10 to 20 years.

All of the tracts are currently leased for grazing. The current livestock grazing lease arrangements are detrimental to many areas on these tracts. The most impacted area is along the river corridor and adjacent floodplain.

Present grazing management does not reflect a set or patterned grazing system that is conducive to proper vegetation management under livestock grazing influences.

Affected Environment

SOCIO-ECONOMICS

The traditional economy of the area is based on ranching. Commercial forestry has played a smaller role. The upper Big Hole Valley is nationally recognized for its recreational opportunities. The growing numbers of visitors interested in fishing, hunting, and general recreation are becoming an increasingly important component of the local economy.

In 1987, property taxes on the tracts totalled $400.92 ($24.52 for Anaconda-Deer Lodge County lands and $376.40 for Beaverhead County lands). Primary economic use of the property is for livestock grazing. Section 9 (200 acres) has a grazing capacity of

23 animal units per month (AUMs); Section 17 (640 acres) has a grazing capacity of 94 AUMs; and Section 19 (635.48 acres) has a grazing capacity of 96 AUMs.

AIR QUALITY

Air quality is excellent throughout the Upper Big Hole drainage and is rated Class II.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

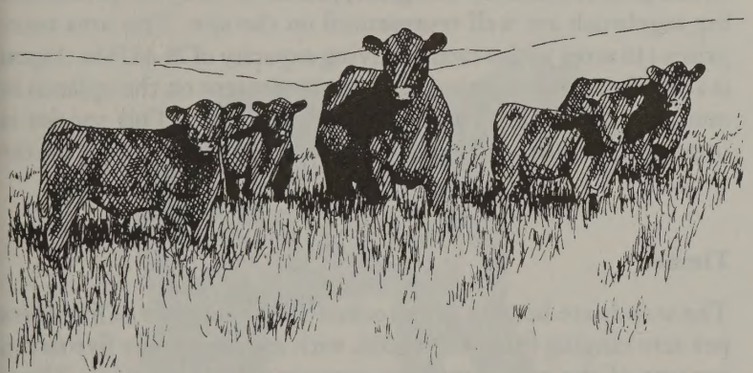
There are no designated or proposed ACEC's on or near these lands, nor are there values indicating a need for ACEC status.

CULTURAL RESOURCES

Review of the Beaverhead/Deer Lodge County lands was accomplished within the Upper Big Hole River Recreation Management Plan. Although Class III cultural resource inventory of the area is incomplete, both prehistoric and historic cultural properties can be expected to occur within the offered lands. No such properties have yet been recorded.

AGRICULTURE (GRAZING)

Plum Creek Timber Company leases these lands for livestock grazing. Neither a specific grazing season, nor numbers of livestock are stipulated in the leases. There are no potential farmlands on these tracts.



FLOODPLAINS

Portions of Sections 17 and 19 are located within the Big Hole River floodplain. A one-mile wide flood plain corridor is located on these tracts. Currently, there is no development within the floodplain.

NATIVE AMERICAN RELIGIOUS CONCERNS

There are no known sites or areas on these lands believed to have religious concern to Native Americans.

THREATENED AND ENDANGERED SPECIES

Bald eagles use the river corridor during the late fall/early spring period for migration and as an over-winter foraging area.

HAZARDOUS WASTES

There are no signs or knowledge of past dumping or disposal activity. The only reasonable source of any hazardous materials would be from use of Montana Highway 43. There are no indications of any accidental spills of toxic substances. It is likely that the highway right-of-way has been sprayed for noxious weeds but this would have no long-term effect.

WETLAND-RIPARIAN ZONES

Riparian habitat diversity within the tracts is very high. Separate and distinct riparian site types are found along the river, perennial and intermittent streams, wet meadows and mesic topographic depressions. Dominant riparian vegetation includes several willow species, aspen, sedges, rushes and many wetland grasses. About 8.5 miles of linear-shaped riparian areas covering approximately 200 acres are found within these lands. The Big Hole River bisects two parcels for a total of three miles of river frontage. All or part of six islands covering about 11 acres are included.

Riparian habitat conditions range from poor to excellent. Generally, the riparian areas within Sections 9 and 17 are in satisfactory condition. An obvious exception is the river corridor which is in unsatisfactory condition. Riparian habitat conditions in the Section 19 parcel are, for the most part, in unsatisfactory condition.

WILD AND SCENIC RIVERS

The Big Hole River is not a designated wild and scenic river, nor is any such review process pending.

WILDERNESS

These lands, in conjunction with the contiguous existing BLM parcels, do not possess the mandated wilderness chacteristics of the Wilderness Act.

TOPOGRAPHY AND SOILS

The topography consists of moderately steep to steep slopes along the river and side drainage with more gently, open slopes along the ridgetops. The narrow river floodplain separates the mountainous lands south and east of the river from the drier benchlands north and west of the river.

Soils vary greatly across these tracts from shallow to deep, and rocky and cobbled to sandy and loamy. Erosion hazards vary from moderate to severe.

VEGETATION

There are approximately 475 acres of commercial forestlands and 1000 acres of meadow, open rangeland, aspen stands, and willow riparian on these lands. The meadow and rangelands are usually found on the south and west aspects. They are dominated by perennial grasses and sagebrush with some Douglas fir encroachment. The aspen and willow areas occur in the drainage bottoms that dissect the tracts, usually accompanying perennial streams that flow from the southwest to the northeast and

empty directly into the Big Hole River. Some aspen stands are also found in sidehill swales. The forestlands occur on mainly northerly aspects and on broad ridges at higher elevations. The stands are often fingers or islands of timber extending toward lower elevations along the Big Hole River from higher forested slopes. The forest stands consist of 100 year old (mature) lodgepole pine, with a few Douglas fir occurring mostly along timber boundaries, in drainages and on south slopes. The trees are post and pole in size and include some small, sawlog sized timber.

Grasses

The vegetation in Section 9 can be typed into two categories as relating to livestock and wildlife use. The first, a sedge—Idaho fescue—big sagebrush type encompasses about 87 acres located mainly on southwest facing slopes on the Section 9 lands. About 70 percent of this vegetation type is composed of various species of sedge, Idaho fescue and big sagebrush type. Other common species include prairie junegrass, lupine, umbrella plant, and numerous other forbs. These lands contain 18 AUMs.

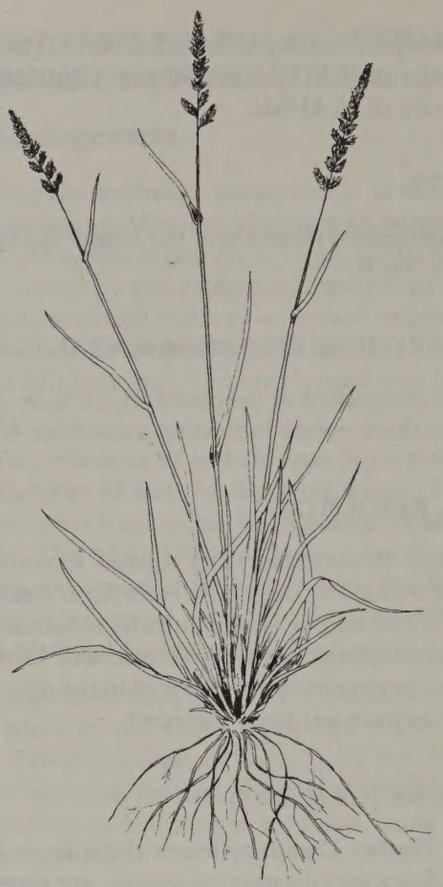
The second vegetative type is a pinegrass type found primarily on north slopes under the predominately lodgepole pine overstory. Pinegrass makes up about 60 percent of the ground cover with Idaho fescue, sedges, grouse whortleberry, twinflower, kinnikinick, and vetches well represented. Other common species include Kentucky bluegrass, bluebunch wheatgrass, buffaloberry, wild strawberry, lupine, and several other forb species. These pinegrass-dominated areas provide little desirable forage for livestock. This type has approximately 113 acres with a carrying capacity of five AUMs. Most of the livestock grazing occurs in small openings and in the creek bottom.

Section 17 has vegetation categorized in three different types. The first is an Idaho fescue-sedge-big sagebrush type with plant composition very similar to this same type in Section 9. This vegetation type takes in approximately 390 acres, lies on south and west facing aspects, and has a carrying capacity of 69 AUMs. This section also contains 167 acres in the pinegrass type which lies on north facing, timbered slopes. The carrying capacity has been rated at three AUMs. Rough fescue is the dominant grass species present.

The last vegetative type is a sedge-willow type lying along the bottoms of Sawlog and Tucker Creeks and the Big Hole River. The sedge and willow species comprise approximately 40 percent of the vegetation. Other well-represented plant species include Kentucky bluegrass, redtop, rushes, and shrubby cinquefoil. Timothy, slender wheatgrass, big sagebrush, wild strawberry, clover and other forb species are also present. This vegetative type measures 56 acres in size and has a carrying capacity of 22 AUMs.

Section 19 can be separated into four vegetation types. Three of the four of these vegetative types have been described in the previous narrative.

Idaho fescue—sedge—big sagebrush type lies on the ridges and southern slopes and encompasses 377 acres with a carrying capacity of 68 AUMs. The pinegrass type is located on about 129 acres on timbered northern aspects and has a carrying capacity of three AUMs. Section 19 also contains a small sedge-willow area along the riverbanks and some streams. No AUMs have been assigned to these areas.



The Idaho fescue—sedge type lies on the north side of the river and highway. Idaho fescue and sedges make up approximately 60 percent of this vegetative type. Prairie junegrass, Richardson's needlegrass, Kentucky bluegrass, phlox, shrubby cinquefoil and big sagebrush are well represented on the site. This area comprises 116 acres with a rated carrying capacity of 25 AUMs. Aspen is a deciduous tree species which is also present on the uplands in moister areas, as well as in the riparian zones. This species is important to mention because its presence denotes these wetter sites.

Timber

The stands are heavily overstocked with a number of live trees per acre ranging from 900 to 1500, with approximately five to ten percent of the trees attaining commercial sawlog sizes. These stocking levels significantly reduce individual tree growth and vigor. Although natural mortality is expected to kill many trees, this is a slow process in this area and stand stagnation is common. Currently, these stands have a moderate risk of mountain pine beetle attack and overstocking tends to increase this risk because of the reduced tree vigor. These stands are expected to increase to high risk over the next 20 years as a higher percentage of trees grow into the eight to eleven inch diameter range, creating optimal conditions for mountain pine beetle attack.

Timber productivity on most forested sites on these tracts is estimated to be moderate. Habitat types are mainly lodgepole pine/grouse whortleberry, with some lodgepole pine/dwarf huckleberry on moister, gentler slopes and lodgepole pine/twinflower and subalpine fir/twinflower on north slopes along the major drainage. The drier, more westerly exposures have a low timber productivity estimate, as these sites tend to have Douglas fir/sedge or Douglas fir/bunchgrass habitat types.

WILDLIFE

Elk

Critical habitat exists on each tract for elk during the fall/late spring period. This area is especially critical during heavy snow years for winter range. All of the tracts are also important as elk summer range. Calving habitat exists but its importance is not documented. Important rutting habitat exists throughout. Primary use is by the resident elk population (500 acres critical).

Mule Deer

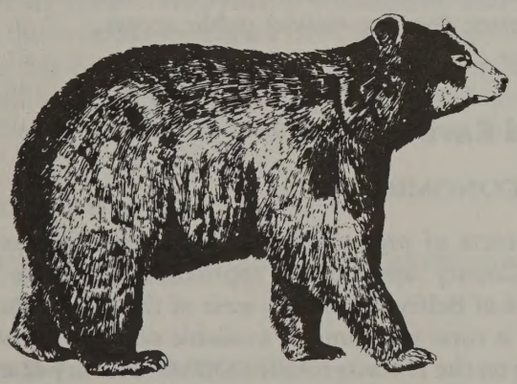
These tracts are critical habitat for mule deer during the winter period. They are also important as spring through fall habitat. Fawning habitat exists which is undoubtably used to some extent (600 acres critical).

Moose

These tracts offer year-round critical habitat for moose. Upland portions are used in the spring through fall. Drainage bottoms and riparian habitats are extremely critical to the wintering population. The area supports a larger population of moose in the winter than in the other seasons (550 acres critical).

Black Bear

Nearly all of the area is important black bear habitat, the exception being the heavily used river and highway corridors. Although not rated critical, some areas are extremely important to the resident black bear population.



Waterfowl

The river corridor, including associated islands and sloughs provides important waterfowl habitat. Breeding populations of Canada geese and several species of ducks are common. Waterfowl production in the area is regionally significant. The floodplain is used extensively by brooding Canada geese. Most of the breeding duck activity is by the later nesting species such as gadwall, widgeon, and cinnamon teal.

Raptors

The area supports very important habitat for a wide variety of raptors. It is most important as foraging and nesting habitat of summer resident species, including three buteos, three accipiters, Northern harrier, kestrel, prairie falcon, and occasionally, osprey. Several species of owls frequent the area as do golden eagles. The importance of this area to raptors is reflected in the diversity of species common to the area. Species diversity is attributed to the wide range of habitats found in the vicinity. Rough-legged hawks commonly winter in the area.

Upland Game Birds

High value habitat exists for the three forest grouse species. Blue and Franklin's grouse are common, while ruffed grouse are uncommon and are probably nearing the edge of their suitable habitat requirements. Sage grouse are common on nearby sagebrush benchlands. This species may occasionally use portions of Section 19, west of the highway.

Nongame

Habitat diversity makes these tracts highly important to a wide variety of nongame species. Distinct and unique habitat components and features such as river riparian, stream riparian, floodplains, sagebrush/ grassland, northslope conifer, rock outcrop, and aspen stands are located within these tracts. They provide the habitat diversity and variation necessary to support the ample nongame species diversity. At least nine Federally designated sensitive species occur in the area, while at least 18 State-listed species of special concern inhabit the area (Plant and Animal Scientific Names).

Fisheries

The Big Hole River is rated a Class I fishery along the reach that intersects these tracts. This designation describes the national significance of this fishery. Rainbow, brown, and brook trout are common to this portion of the river, as are arctic grayling and mountain whitefish. The grayling is a sensitive species on State and Federal listings and may soon receive threatened and endangered species status.

MINERALS

Oil and Gas

Oil and gas rights will be reserved by Meridian and will not be transferred.

Mineral Materials/Mining Claims

These lands are situated along the Big Hole River approximately three air miles from the nearest significant mining activity which occurred at the Calvert Mine, a producer of tungsten during the 1950's under a government tungsten purchasing program.

The Calvert Mine produced about 102,000 tons of ore in 1956 and 1957 and another 10,000 tons in 1959. There was some exploration and development work done on the Calvert Mine in 1966 and 1967 but the project has since been abandoned.

Other prospects/operations nearby produced small tonnages of gold, silver, and copper from lode deposits but none of them are currently operating and all produced less than 500 tons of ore.

No placer production has been recorded in the area and the occurrence of a viable placer deposit within the area is highly unlikely.

Moderate to good potential for the occurrence of lode deposits of gold, silver, copper or tungsten exists in the area as indicated by the presence of the metals previously discussed.

Therefore, if the right economic stimulus occurs, an increase in exploration activity can be expected with the possibility of producing mines operating on or near the parcels.

There is a high probability of economically recoverable gravel deposits along the river corridor, although development is unlikely because of better sites nearby.

HYDROLOGY

Surface Water

About 1.5 miles of the Big Hole River cross Sections 17 and 19. The river channel is gradually becoming wider and shallower due to erosion of the stream bank, caused primarily by livestock grazing. Sawlog Creek, a perennial stream, crosses Section 17 for 3/4 of a mile. There are several seeps scattered across the tracts.

Ground Water

The quality and quantity of ground water is not known. The water table can be assumed to be shallow due to the river and several seeps found in the tracts.

Water Quality

Water quality of Sawlog Creek is excellent, while water quality of the Big Hole River is good. The amount of suspended solids is low. There is a lot of color (dissolved solids) from extensive use for irrigation of native haylands. There are some thermal problems in the summer along this stretch of river.

RECREATION

These tracts are highly important to recreationists because they are adjacent to the nationally renowned Big Hole River which is a floatable Class I fishery. Statewide, the river ranks second only to the Madison River for total fishing days. River floating and fishing are the primary recreation attractions of the area. Specifically, these lands border the river on both sides for approximately one and a half miles. The natural and physiographic characteristics of the upper slopes provide high quality scenic values. Recreation opportunities associated with these parcels include fishing for mountain whitefish, brook trout, arctic grayling, and rainbow trout; hunting for deer, elk, and waterfowl; trapping for a variety of furbearers; undeveloped camping, and day-use activities such as photography, picnicking, hiking, horseback riding, and nature study. River floating along this stretch of the river is best suited to rafts from May to mid-July. The setting and characteristics of this area are categorized as "Rural" by the Recreation Opportunity Spectrum (ROS) guidelines and have a Visual Resource Management (VRM) rating of Class II. No recreation developments exist on these parcels.

STRATIGRAPHY AND GEOLOGY

This portion of the Big Hole River basin is situated near the forward edge of the Grasshopper thrust plate. A large tertiary granitic pluton which forms the western flank of the Pioneer Mountains is separated from the Pioneer Batholith on the east by Missoula Group metasediments. Minor occurrences of tertiary volcanic rocks of composition ranging from felsic to mafic also may be observed. Sedimentary rocks other than the Missoula Group metasediments are limited to Quaternary surficial deposits.

PRIORITY LANDS NO. 6 — CARBON COUNTY (6,195.56 acres)

Current Management

Main access to the property is south from Laurel and Belfry via U.S. Highway 310 and Montana Highway 72. Highways 310 and 72 are paved, two-lane highways, with year-around access. The roads are maintained by the Montana Department of Highways. Primary use of the roads in this area are local use, with some traffic resulting from recreational use in the summer. Access to the east entrance of Yellowstone National Park from Billings may be made along this route.

The lands themselves are accessed by a number of dirt two-track trails that criss-cross the area. Access to the area is from a county road (Meeteetse Trail Road) bordering the northeast boundry of the township and from county roads that extend up to the southeast edge of the township. These trails criss-cross the checkerboard pattern of land ownership of private and public lands. These lands are presently used for livestock grazing. The present lessee does not restrict public access.

Affected Environment

SOCIOECONOMICS

The 13 tracts of property being considered for exchange in Carbon County are located approximately six to 12 miles southwest of Belfry, Montana, west of the Clarks Fork River. The area is rural with limited available services. In 1987, property taxes on the 13 tracts totalled $709.17. Primary economic use of the property is for grazing, with a total grazing capacity of 984 AUMs.

AIR QUALITY

This area is a Class II air quality area.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

There are no formally designated ACEC's on these lands although the N½ of Section 5 is within an area proposed by The Nature Conservancy for special designation known as the Meeteetse Spires Preserve. This proposed special designation for this area would protect a rare plant species for Montana, shoshonea.

This area contains the largest known population of this plant species in Montana and possibly the world. Population estimates for this particular plant species are in the range of 6,000 individual plants. No plants were found on these offered lands.

CULTURAL RESOURCES

No cultural resource Class III inventories have been conducted on the affected offered private lands. Existing inventory, completed in part for the Grove Creek Allotment Management Plan and for the Phillips Ruby A Federal No.1-9 Exploratory Oil/Gas Well EIS (draft), indicates a diverse array of both prehistoric and historic cultural properties. Of particular note is the historic Meeteetse Trail, an early transportation route eligible for listing on the National Register of Historic Places.

AGRICULTURE (FARM AND GRAZING)

There are no agricultural lands on these offered lands. These lands are used for livestock grazing and recreation.

FLOODPLAINS

There are no flood plains on the affected lands.

NATIVE AMERICAN RELIGIOUS CONCERNS

There are no known areas on these lands of religious concern to Native Americans.

THREATENED AND ENDANGERED SPECIES

There are no known threatened or endangered wildlife species utilizing this area. Shoshonea is a rare plant species found in this area that has been nominated as a candidate for listing as a threatened and endangered plant by the U.S. Fish and Wildlife Service; however, no plants were found on these lands.

HAZARDOUS WASTES

There are no known hazardous waste or landfill sites on these lands.

WETLAND-RIPARIAN ZONES

There are several intermittent streams but only one perennial stream, Grove Creek, which flows through T9S., R21E., Section 1.

WILD AND SCENIC RIVERS

There are no proposed or designated wild and scenic rivers or drainages in this area.

WILDERNESS

No proposed or designated wilderness or wilderness study areas exist in the immediate area. Due to the number of existing roads and the low wilderness qualities, this would probably preclude any of this area from being considered or designated as wilderness. The closest wilderness area is several miles to the west on Forest Service land.

TOPOGRAPHY AND SOILS

The soils are mainly deep, well-drained, stony loams and loams. They occur, for the most part, on gently sloping to moderately steep stream terraces and alluvial fans.

VEGETATION

Vegetation on these offered lands consist of bluebunch wheatgrass, Western and thickspike wheatgrass, needle and thread, green needlegrass, basin wildrye, threadleaf sedge, prairie junegrass, native legumes, big and silver sagebrush, skunkbush sumac, common chokecherry and blue grama. All these plant species are common to areas of the silty range site condition within the western sedimentary plains which make up approximately the western two thirds of the offered tracts in the township.

Plant species on the tracts in the eastern third of the township are common to the dense clay-clayey-saline upland range site complex within the western sedimentary plains. Plant species consist of western and thickspike wheatgrass, inland saltgrass, Nuttall saltbush, big sagebrush, black sagebrush, bud sagebrush, shadscale saltbush, greasewood, sandberg bluegrass, prairie junegrass, bluebunch wheatgrass, plains reedgrass, milkvetches, winterfat, blue grama, alkali sacaton, basin wildrye, and bottlebrush squirreltail.

WILDLIFE

The area supports a low density resident population of antelope and provides transitional range for mule deer that move from higher elevation summer ranges to the west to lower elevation winter ranges to the east. The area does not support a year-round resident mule deer herd. Several of the parcels provide habitat for a resident year-round population of white-tailed deer. These lands also include several sagegrouse leks that would add to the known grouse leks that occur on the currently existing public lands in the area.

OTHER MINERALS

Oil and Gas

Oil and gas will be reserved by Meridian and will not be transferred or change ownership. These lands lay just west of the abandoned No.2 well, Belfry oil field, in T.9S., R.22E., Section 7.

Mineral Materials/Mining Claims

No known deposits of salable, leasable or locatable minerals are known to exist on these lands. There are no mineral leases, mining claims, mineral material sites or mineral operations on any of these tracts.

Coal

The Fort Union Formation is coal bearing in this region, but the minable coal beds of the Bear Creek Field, several miles north, thin before reaching this particular area. The Fort Union contains no other minerals of economic importance here. The tracts are considered to have low mineral development potential. The mineral interest in these tracts is considered to be of negligible value.

HYDROLOGY

Surface Water

The lands are located on the east side of the Beartooth range. The only major perennial stream in the area is Grove Creek. This is a result of the area being in a rainshadow. The surface formation consists of rocky colluvium derived from the mountain range.

Ground Water

The surface material of the area is composed of outwash from the mountain range. The colluvium is composed of gravel and rock but it does contain groundwater which is evidenced by the many springs in the area. There is also groundwater available in limited quantities at the bottom of the colluvium. The depth of the colluvium is approximately 200 feet thick with groundwater at or near the base in portions of the area.

Water Quality

The quality of the water is adequate for livestock but is not normally used for domestic purposes.

RECREATION

Recreation use on these lands is considered light and consists mainly of mule deer hunting. At the present time the rancher permits limited walk-in hunting and will give permission to hunters to retrieve their game by vehicle. Recreation use is estimated at 150 user days, although there is excellent potential to increase this use considerably. There are no unique visual qualities and most of the area would be classified as a Class III VRM management class.

STRATIGRAPHY AND GEOLOGY

The subject tracts are located within the bench lands along the westside of the Clarks Fork of the Yellowstone River. The entire township, except for the northeast corner, is underlain by Quaternary Pliocene/ Pleistocene terrace remnants composed of gravel, sand and silt deposits. The northeast corner of the township is underlain by the Fort Union formation, a tertiary Paleocene clay shale, siltstone and sandstone formation.

Other Coal Lands

Other coal lands that are under consideration for exchange are the Meridian offered coal lands in the Peabody Big Sky Mine — Area B. The mine is about 6.5 miles south-southwest of Colstrip in Rosebud County, Montana. The Meridian offered coal lands are inside the mining plan permit area for Area B; the mining permit was recently approved (January 1989) and issued to Peabody Coal Company by Montana Department of State Lands.

The offered private lands are located in the Lee Coulee drainage, an ephemeral tributary of Rosebud Creek (Figure 2.6). The offered lands are part of the wide, relatively flat valley floor of Lee Coulee and typical of the lands in the area presently being mined.

The offered private coal is part of the Rosebud coal seam which averages 23.88 feet in thickness in this area. About 575 acres containing 21.2 million tons of recoverable coal are within the three offered parcels of lands. These lands and resources are fully described in the Peabody Big Sky Mine Plan and Peabody Big Sky Mine-Area B EIS, Chapter III (Montana Department of State Lands and United States Office of Surface Mining Reclamation and Enforcement, 1988). Therefore, this information will not be repeated here.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

Introduction

This section analyzes the site specific and cumulative effects of exchanging the lands and minerals involved in the proposed action and various alternatives. This section also analyzes the effects of constructing and operating a small (0.5 million tons per year) and large (3.0 million tons per year) underground coal mine in the Bull Mountains. Impacts relating to the transportation and temporary storage of the coal at the load-out facility are also addressed.

ASSUMPTIONS AND ASSESSMENT GUIDELINES

The following assumptions were used to develop the analysis if the Federal coal lands were exchanged or leased:

(1) Meridian or YCC would develop the coal.

(2) The coal company would be able to find a market for the coal and secure long-term contracts of sufficient quantity to justify development in the 0.5 million to 3.0 million tons of coal per year range.

(3) The actual sale price of the Bull Mountains coal from these contracts would be $15.00 per ton F.O.B. mine. This figure was used for all the socioeconomic figures associated with Alternatives A, B, and C. The actual sale price could be higher as indicated by current coal market conditions or lower based on Meridian's operating cost estimates; however, for comparison purposes and consistency, a $15.00 per ton F.O.B. mine figure was used for this analysis.

(4) For the leasing alternative, a $15.00 per ton F.O.B. mine figure was used to calculate royalty values if BLM leased the coal immediatly. If BLM had to wait until coal market conditions were favorable for development, a $25.00 per ton F.O.B. mine figure with a 2020 mine start-up date was used to calculate royalty values. Appendix 11 gives an in-depth discussion of current market conditions. BLM used the mid-range of the sale price values and start-up to develop this scenario.

(5) The mining company would apply for a mining permit in June 1989. The mining permit would be approved by June 1990. Construction of the mine would begin then and the mine would be in production by November 1990.

(6) The production figures for the 0.5 million tons per year mining operation were provided by YCC and the figures for the 3.0 million tons per year mining operation were provided by Meridian. BLM used these figures and existing coal data from the area to develop the two mining scenarios.

(7) If BLM's decision was to lease Federal coal rather than to exchange it, the mining company would submit an application to lease these lands and BLM would be free to lease the Federal coal lands to the company.

(8) Regardless of which decision or alternative BLM selects, the timeframes to process the decision and associated actions would be within the constraints and limits that the mining company would need to secure a contract for the coal and develop a mine.

REASONABLY FORESEEABLE DEVELOPMENT SCENARIOS

Development of the Coal Lands

Two levels of mining for both the exchange and leasing alternatives are analyzed in this EIS. These levels are a 0.5 million tons of coal per year room and pillar operation and a 3.0 million tons per year long-wall operation. The acreage and recoverable coal reserves for the exchange and leasing alternatives are shown in Table 4.1.

TABLE 4.1

RECOVERABLE COAL RESERVES

	Acres of Recoverable Coal	*In Place Coal (million tons)*	*Room and Pillar Mining[1] (million tons)*	*Longwall Mining[2] (million tons)*
Exchange Alternative				
Recoverable Federal Coal	3010.0	54.5	27.3	43.6
Recoverable Private Coal	3274.5	59.0	29.5	47.2
Total	6284.5	113.5	56.8	90.8
Leasing Alternative[3]				
Recoverable Federal Coal	3158.0	56.9	28.4	45.5
Recoverable Private Coal	3869.0	67.3	33.6	53.8
Recoverable State Coal	640.0	11.3	5.7	9.1
Total	7667.0	135.5	67.7	108.4

[1]Mining rate of 0.5 million tons annually and a 50% recovery rate.

[2]Mining rate of 3.0 million tons annually and an 80% recovery rate.

[3]There are an additional 197.59 acres of Federal mineral estate of which 148 acres contain recoverable coal resources considered in the leasing alternative. At a 50% recovery rate, the amount of recoverable coal would increase by 1.1 million tons using a room and pillar mining method. At an 80% recovery rate, the amount of recoverable coal would increase by 1.9 million tons using a longwall mining method.

0.5 MILLION TONS ANNUAL PRODUCTION

A room and pillar mining method would likely be used to produce coal at the 0.5 million tons per year rate. Necessary equipment and facilities are listed in Table 4.2. This method of mining utilizes continuous mining machines and shuttle car/conveyor belt haulage to move the coal to the surface. For the room and pillar mining technique about 50 percent of the coal is recovered by two intersecting sets of parallel entries, usually nearly perpendicular to one another. The result is a checkerboard array of coal pillars which will remain to support the roof strata.

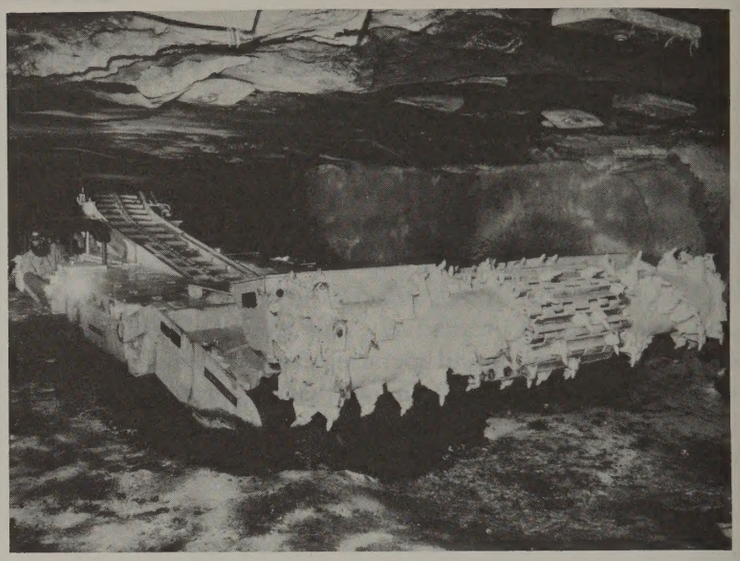
TABLE 4.2

0.5 MILLION TONS PER YEAR MINING EQUIPMENT

Underground Mining Equipment		*Mine Surface Facilities*
Units	*Equipment*	*Equipment*
2	Continuous miners	Stacking belt
3	Shuttle cars	Run-of-mine stockpile (approx.
1	Roof bolter	5,000 tons)
2	S & S scoop	Cleaning plant
2	Personnel carriers	Clean coal stacker
1	Power center and associated high voltage lines	Clean coal stockpile (approx. 10,000 tons)
1	42-inch belt drivers and tailpieces	Refuse area
		Mine office/changehouse
1	8-foot ventilation fans capable of moving 13,000 CFM of air at the mining face	Shop

Access to the coal seam would be by five main headings being driven on 70 foot centers with mining widths of 18 to 20 feet depending on local roof conditions. This method would leave coal pillars 50 to 52 feet wide to support the roof over the main entries. The headings containing the conveyor belt, air courses, utilities, and miner-trip/supply routes would be driven from the portal site on the western edge of the coal field to the eastern limit of the mine. Barrier pillars 300 feet wide would be left between the main entries and the mining panels. The mining panels would then be developed southward from the main entries on 50 foot centers. Room widths would remain at 18 to 20 feet while coal pillars are reduced to 30 to 32 feet to increase coal recovery. There are no current plans for secondary mining, ie., pillar robbing, which would increase room widths. Past mining and empirical estimates show that subsidence over most of the proposed room and pillar mining areas would not be a noticeable problem. There is some chance that under shallow overburden, less than 40 feet, sinkhole subsidence could occur. Figure 2.1 shows a plan view of the room and pillar mining layout.

Mine surface facilities would be located at the mine site in T.6N,R.26E, Section 13 or Section 25. Coal would be conveyed from the mine to a run-of-mine stockpile. From this stockpile it would be conveyed to two 8 by 16 one inch double deck screens. One inch plus oversize coal would be crushed by a 60 inch roll crusher. The crushed coal would then be fed to two air flotation cells with baghouses. Reject from the air flotation cells would be sent to a refuse bin and hauled by truck to a refuse fill area in the vicinity of the mine mouth facitities. Clean coal would then be conveyed to a radial stacker and stockpiled.



SR500 SHC Miner Continuous Miner
Photo courtesy Joy Technologies, Inc.

Trucks would be loaded from the clean coal stockpile and hauled to a rail loadout facility located in T.2N.,R.28E., Section 19, at Huntley, Montana and stored in a 12,000 to 15,000 ton stockpile. The rail car loading rate would be 3,000 tons per hour using a 60 inch belt from the stockpile onto 12,000 ton unit trains. A railroad siding would be able to hold 120 rail cars. The plan also calls for the loading of industrial coals in lesser amounts, at 10 to 30 cars at a time.

Transportation Corridor — All coal would be trucked from the mine site on the Old Divide Road onto U.S. Highway 87 south to U.S. Highway 312 just north of Billings, Montana and then east to Huntley, Montana. All trucks would be adequately tarped and inspection ready to meet all highway standards. An estimated 50 one way trips a day would be needed to haul the coal from the mine to the loadout facility at Huntley. Map 9 shows the proposed route.

Employment — The following number of employees are expected for the 0.5 million ton per year mining rate.

Number of Employees	Facility
2	Office
12	Underground
5	Mine surface facility
5	Loadout facility
11	Contract independent truckers

Additional information regarding employment and payroll is shown on Table 4.3.

Depending on how successfully the coal is marketed, expansion of the mining operation could occur. Coal production could increase to about 1.2 million tons per year using the room and pillar mining plan described above without major expenditures for additional underground mining equipment. Increased production could occur by adding a second work shift using essentially the same mining equipment and surface facilities. Additional employment would be expected, at least, for mining and coal transportation. At some point near the high end of an

TABLE 4.3

COAL DEVELOPMENT/TRANSPORTATION SUMMARY
ROOM AND PILLAR MINING
0.5 million tons per year production

YEAR	(x 1000) PRODUCTION TONNAGE	(Cumulative) WASTE DISPOSAL (acres covered)	DIRECT EMPLOYMENT						(Based on TCC Rates) DIRECT PATROLL (x $1000)						PERCENT LOCAL HIRES[1]						TRANSPORTATION		
			MINE		TRANSPORT.		LOADING FAC.		MINE		TRANSPORT.		LOADING FAC.		MINE		TRANSPORT.		LOADING FAC.				
			Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Mode[2]	Tripi-Day[3]	Route
1. 1990	100	.09	9	10	—	3	5	3	84	104	—	31	47	31	89%	75%	—	100%	100%	100%	TRK	10	87/312
2. 1991	200	.18	7	15	—	5	—	4	112	312	—	100	—	56	100%	75%	—	100%	—	100%	TRK	20	87/312
3. 1992	300	.28	—	16	—	7	—	4	—	336	—	140	—	56	—	75%	—	100%	—	100%	TRK	20	87/312
4. 1993	400	.37	—	18	—	9	—	5	—	385	—	180	—	75	—	75%	—	100%	—	100%	TRK	40	87/312
5. 1994	500	.47	—	19	—	11	—	5	—	416	—	220	—	83	—	75%	—	100%	—	100%	TRK	50	87/312

[1]Local hires are defined as people who are residents of the area and who do not change their residence when they accept employment.
[2]Truck or rail.
[3]Loaded trucks or rail cars per day.
Source: United States Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.
Yellowstone Coal Company development estimates.

expanded production scenario, it would become economical and desireable to convert to a longwall mining operation and to build a railroad spur to the mine site. Coal production between 1.2 and 3.0 million tons per year would likely be mined by a longwall mining method. It is also possible that longwall mining could be used at the outset.

3.0 MILLION TON ANNUAL PRODUCTION

Longwall mining would increase the coal recovery rate to approximately 80 percent. Access to the coal seam under the longwall mining method will be much the same as in the room and pillar mining method previously described, except that the entries will be directed more to the northeast. Longwall panels will be developed on both sides of the main entries to the southeast and northwest. Figures 2.2 and 2.3 show plan views for the longwall mining layout.

During longwall mining a block or panel of coal approximately 600 feet wide is isolated by two sets of parallel entries driven by continuous mining machines. The lengths of the panels are variable, but usually determined by geologic or engineering considerations. Longwall mining equipment consists of: a plow or shearer used to break the coal from the coal face; a face conveyor belt to transport the coal away from the face; and a mobile roof support system placed at the far end of the longwall panel. The coal mining face retreats toward the panel entries and the roof support system temporarily supports the overlying strata as the coal is being severed from the face. The roof support system then retreats, allowing the roof to cave in behind the longwall equipment. Planned subsidence is an integral part of longwall mining. Needed equipment is listed in Table 4.4.

As with the room and pillar mining method, the coal is conveyed to a run-of-mine stockpile. Sizing and cleaning the coal would be the same as described in the discussion of the 0.5 million tons per year production rate except that a wet coal benefication process will probably be used in the cleaning operation.

Before a production rate of 3.0 million tons of coal per year could be obtained, a rail spur to the mine would be needed to move the coal efficiently. The route for a spur has not yet been selected, however, two possible routes are being reviewed.

TABLE 4.4

3.0 MILLION TONS PER YEAR MINING EQUIPMENT

Underground Mining Equipment		*Mine Surface Facilities*
Units	*Equipment*	*Equipment*
2	Continuous miners	Stacking belt
4	Shuttle cars	Run-of-mine stockpile (approx.
2	Roof bolters	30,000 tons)
3	S & S scoop	Cleaning plant
3	Personnel carriers	Clean coal stacker
2	Power centers and high voltage cables	Refuse area Mine office/changehouse
4	60-inch belt drivers and tailpieces	Shop Clean coal storage
2	17-foot ventilation fans	2 silos of approx. 12,000 tons
1	Longwall miner and associated equipment	each for clean coal

Employment — Operating at full capacity, an estimated 199 employees would be needed for the underground, surface, and office operations. An additional eight employees would be needed for the loading facility. Table 4.5 provides additional information on direct employment, payroll, and transportation.

The Bull Mountains Railroad

ROUTE AND DESIGN CHARACTERISTICS

The process of expanding the mine from 0.5 million tons of coal per year to 3.0 million tons of coal per year, would necessitate the building of a railroad spur for transporting the coal from the mine to the rail head. The increased volume of coal, probably somewhere around 1.5 million tons of coal per year, triggers the necessity of a railroad because it becomes uneconomical and infeasible to use trucks for transportation. The railroad spur

TABLE 4.5

COAL DEVELOPMENT/TRANSPORTATION SUMMARY
LONGWALL MINING
3.0 million tons per year production

YEAR	(x 1000) PRODUCTION TONNAGE	(Cumulative) WASTE DISPOSAL (acres covered)	DIRECT EMPLOYMENT						(Based on TCC Rates) DIRECT PATROLL (x $1000)						PERCENT LOCAL HIRES[1]						TRANSPORTATION		
			MINE		TRANSPORT.		LOADING FAC.		MINE		TRANSPORT.		LOADING FAC.		MINE		TRANSPORT.		LOADING FAC.				
			Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Const.	Ops.	Mode[2]	Trips-Day[3]	Route
1. 1990	0	0.00	23	30	—	—*	12	—	239	156	—	—	125	—	75%	67%	—	—	83%	—	—	—	—
2. 1991	500	1.49	12	71	—	12	6	4	239	1,477	—	250	31	83	75%	67%	—	90%	83%	53%	TRK	50	87/312
3. 1992	800	2.38	—	71	—	19	—	4	—	1,477	—	395	—	83	—	67%	—	90%	—	53%	TRK	80	87/312
4. 1993	1,200	3.58	—	136	—	27	—	8	—	2,830	—	562	—	166	—	74%	—	90%	—	60%	TRK	120	87/312
5. 1994	2,100	6.27	12	168	13	27	7	8	250	3,485	270	562	135	166	75%	70%	90%	90%	70%	60%	TRK RAIL	120 6 mo.=110	87/312
6. 1995	3,000	8.96	—	199	—	—	—	8	—	4,140	—	—	—	166	—	75%	—	—	—	60%	RAIL	110	**

[1]Local hires are defined as people who are residents of the area and who do not change their residence when they accept employment.
[2]Truck or rail.
[3]Loaded trucks or rail cars per day.

*Transportation employment does not include railroad workers and it is assumed that trucking will be done by contractors instead of mine employees, although truck drivers are included in the table above.
**Specific route not determined; see text for two alternative routes.

Source: United States Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.
Meridian Minerals Company development estimates.

route has not been determined but two alternatives are being considered (Map 9).

The first alternative route would head north from the mine along U.S. Highway 87 to a point west of Roundup, Montana. It would then follow the old Milwaukee railroad grade west to Lavina, Montana, where it would join the mainline Burlington Northern railroad. The second alternative route would head west from the mine towards the vicinity of Broadview, Montana and join the mainline Burlington Northern railroad there (Map 9).

It would require a permit from the Interstate Commerce Commission and supplemental environmental analysis and documentation to build this railroad spur. Since a specific route has not been selected, only the more apparent environmental issues associated with building a railroad are addressed here. The mainline railroad is of sufficient strength and design for hauling coal so additional reconstruction of the mainline would not be needed to handle this capability (Bob Moorhead, personal communication, September 11, 1989). However, there could be some grade crossings that would need to be upgraded with traffic signals, etcetera, depending upon the route and the final destination of the coal. Also, it should be noted that both routes involve mostly private surface lands. BLM would only be involved in the permitting process if the selected route crossed BLM administered public lands.

General design characteristics of the rail line would include:

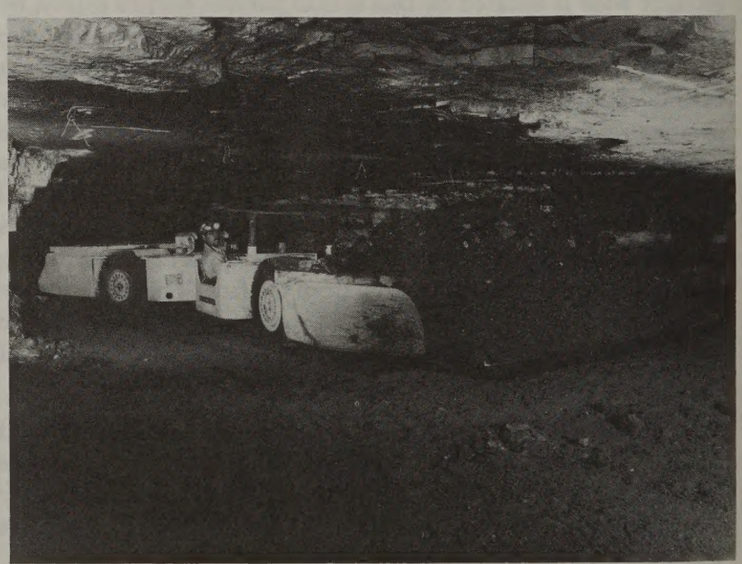
(1) Single track rail line from the mine to the mainline railroad. Major sidings (10 to 20 miles apart) may or may not be required, depending upon the route selected.

(2) Right-of-way width of 100 to 200 feet depending upon the terrain with an average width of 150 feet. The right-of-way would probably be fenced.

(3) Maximum grade of one percent and maximum curvature of three degrees.

(4) Average unit train consisting of 110 cars, each having a capacity of 100 tons of coal. Depending upon the mine production, the number of trains per day needed to haul the coal would vary. At the 3.0 million tons per year production rate, approximately one train per day would be needed to transport the coal.

Using these general design characteristics and the alternative routes described previously, the north route would be approximately 40 to 45 miles in length and would require 727 to 818 acres of right-of-way. The estimated cost to build this railroad spur would be 40 to 45 million dollars (assuming one million dollars



488X90 UN-A-TRAC Load-Haul-Dump Tractor
Photo courtesy Joy Technologies, Inc.

per mile). Likewise, the west route would be approximately 25 to 30 miles in length and cost 25 to 30 million dollars. It would require one to 1½ years to construct the railroad spur.

RESOURCE IMPACTS

The major impacts associated with building the railroad spur would mainly be associated with construction, although there would be some long-term impacts associated with maintenance and operations. There will be minimal or no impacts to the following:

Areas of Critical Environmental Concern
Native American Religious Concerns
Hazardous Wastes
Wild and Scenic Rivers
Wilderness
Minerals
Threatened and Endangered Species

Anticipated impacts from construction and operation of the railroad spur are as follows.

Socio-Economics

Construction of the railroad would probably be accomplished by contracted construction firms (Bob Morehead, Manager, Bull Mountains Project, Meridian Minerals Company, Roundup, Montana. Personal communication, April, 1989). The construction labor force would involve approximately 26 workers. It is anticipated that most of this work force would consist of present employees of the contracted construction firm.

Depending upon the route chosen, it could cost 25 to 30 million dollars (west route) to 40 to 45 million dollars (north route) to build this railroad spur. An estimated breakdown of these costs over the two years would be 40 percent for wages and salaries of the labor force, 30 percent for capital expenditures such as rail and railroad ties, and 30 percent for local expenditures such as gasoline, gravel and operating costs.

Most of the capital expenditures would be out-of-state purchases since these items are not readily available in Montana. Local businesses will experience a boom from the infusion of money spent on local purchases by the construction company and workers over the two year period. There are no long term adverse economic and social impacts expected from the construction of the railroad.

Transportation

The movement of materials, equipment and workers would create a short-term increase in transportation use in the area during construction of the right-of-way. Access to the right-of-way would probably be over existing roads and trails and along the proposed route. Although much of the material and equipment would probably be hauled to the construction site over the new laid rail, there would still be considerable highway use by large trucks hauling materials and equipment to the site, increasing the potential for highway accidents. Long-term transportation impacts would primarily be limited to the use of the right-of-way by approximately one unit train per day hauling coal from the mine. If the proposed right-of-way crosses U.S. Highway 87, there would be increased potential for accidents at the crossing.

Air Quality

There will be a temporary, minor impact to the air quality of the area from construction. Emissions would be intermittent and localized to the railroad right-of-way. During operations, there will be air pollutant emissions from dust blowing off the rail cars and emissions from the locomotives; however, these emissions will be relatively low, short-term and insignificant to the overall air quality.

Cultural Resources

Cultural impacts are expected to be relatively low for either route. Most of these impacts would occur along that portion of the route in the Bull Mountains area. Heading north, the route would follow existing developed rights-of-way where disturbance has already occured. Likewise, the west route would cross areas of cultivated agricultural lands where cultural sites have already been destroyed.

Agriculture

Approximately 727 to 818 acres of agriculture lands would be removed by the right-of-way for the north route and 454 to 545 acres would be removed for the west route. Most of the lands would be rangeland used for livestock grazing. There would also be some disruption of ranching operations and inconvenience from the railroad right-of-way.

Floodplains

Impacts would be minor for either route. Halfbreed Creek and the Musselshell River could be impacted on the north route; whereas, very few drainages and floodplains would be affected by the west route.

Wetlands/Riparian Zones

There will be minor impacts. (See floodplains.)

Topography and Soils

Impacts to the topography and soils would result from the varied amounts of disturbance required to develop the right-of-way. There would be some soil erosion until the right-of-way has stabilized. There would also be a long-term loss of soil surface from productivity, i.e. that portion of the right-of-way used for the railroad bed. Overall, these impacts are relatively minor over the entire area.

Vegetation

The impacts on vegetation in the right-of-way would range from slight disturbance to destruction. Most of the impacts would occur during construction. Over time, the right-of-way vegetation would stabilize and become productive again. There would probably be some long-term changes in plant communities and composition within the right-of-way.

Wildlife

The major impacts on wildlife would be noise, human harassment and train/animal collisions. Some species, particularly large mammals and some birds, would probably be displaced. Long term changes in the plant communities and composition along the right-of-way would also cause changes in the wildlife species and numbers utilizing the right-of-way. Some mortalities from train collisions would be expected along the right-of-way. The portion of the right-of-way used for the railroad bed would be lost as wildlife habitat. It is unknown whether any crucial or sensitive wildlife area would be impacted along the route. It is presumed that route selection and mitigation measures would be implemented, if needed, to minimize these wildlife impacts.

Hydrology

The major impacts on hydrology would be increased sediment from cuts and fills along the proposed route and disturbance of stream channels during the construction phase of the railroad. Afterwards, soil erosion will decrease and stream channels will stabilize accordingly. Long term impacts on hydrology would be minor.

Recreation

Recreational activities in the area would not be appreciably affected by the railroad. There would be a loss of hunting and other dispersed recreational activities along the right-of-way. Also, there would probably be increased demand for recreation activities and facilities by workers during construction but these demands would be localized and short-lived.

As part of the right-of-way permitting process, it is anticipated that mitigation measures would be required by the ICC that would lessen or eliminate most adverse impacts resulting from construction and operation of the railroad spur. Examples could include restrictions for travel, construction, route selection, erosion, re-seeding, etcetera.

Some adverse impacts from the railroad spur would be unavoidable, such as loss of lands for agriculture and impacts on topography, visual resources, vegetation, cultural resources, wildlife, etcetera. However, it is anticipated that the overall impacts would be minor to the region.

Proposed Action—Coal for Lands Exchange—Preferred (Alternative A)

SELECTED FEDERAL COAL LANDS

0.5 Million Tons of Coal Per Year Mine

Development of the selected Federal coal lands as an underground mine producing 0.5 million tons coal per year is considered the most likely development to occur in the Bull Mountains.

RESOURCES NOT IMPACTED

This small room and pillar mining operation will have minimal or no impacts to the following resources:

Areas of Critical Environmental Concern
Agriculture
Floodplains
Native American Religious Concerns
Threatened and Endangered Species
Hazardous Wastes
Wetlands/Riparian Areas
Wild and Scenic Rivers
Wilderness
Other Minerals
  Oil and Gas
  Mineral Materials/Mining Claims

RESOURCES IMPACTED

Anticipated impacts from mining to the other resource values are as follows.

Socio-Economics

Economic Environment

Economic Assumptions

The proposed coal mine, located in southern Musselshell County and northern Yellowstone County, would be an underground facility operated by Yellowstone Coal Company. Construction of the mine would commence in July 1990, and production would begin in late 1990. Production would increase steadily until 1994 when the mine is expected to be at full production. The project would produce an estimated 0.5 million tons of coal per year (Table 4.6) and, during full production, would employ approximately 35 mine-related workers.

It is assumed that coal contracts would be negotiated with an out-of-state utility and coal would be shipped by rail to the utility site. Since there are currently no rail loading facilities in Musselshell County, the coal produced from the proposed mine would be transported by truck from the mine site to a rail load-out facility. For purposes of this study, it is assumed that the railroad siding in Huntley, Montana, approximately 38 miles southeast from the proposed mine site, would be used for shipping the coal. Economic impacts due to the land exchange and subsequent operation of the mine are described in the following sections in terms of impacts on employment, income, and the fiscal conditions of local, State, and Federal governments.

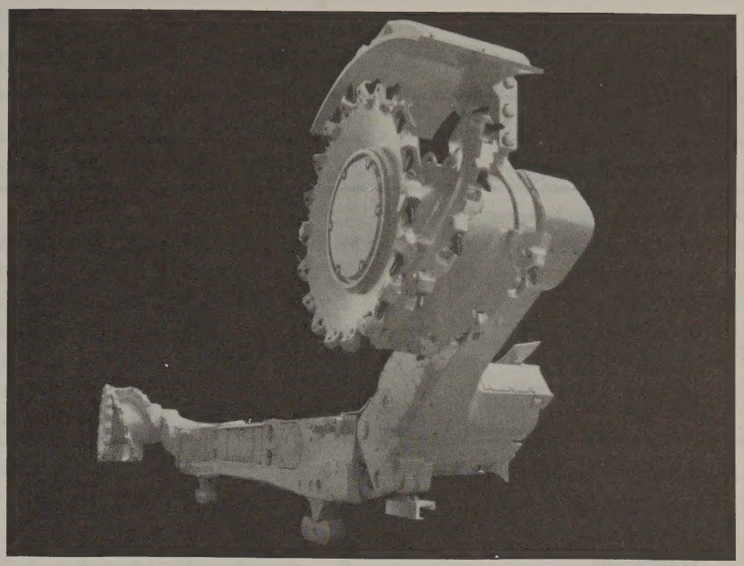
TABLE 4.6

PROJECTED COAL PRODUCTION — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (Tons of Coal)

Year	*Yellowstone County*	*Musselshell County*	*Total*
1990	0	100,000	100,000
1991	0	200,000	200,000
1992	0	300,000	300,000
1993	0	400,000	400,000
1994	100,000	400,000	500,000
1995-2037	500,000	0	500,000
2038-2063	0	500,000	500,000

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.

Yellowstone Coal Company development estimates.



4LS Longwall Shearer
Photo courtesy Joy Technologies, Inc.

Employment

As a direct result of the proposed land exchange and subsequent operation of the underground coal mine, employment opportunities would be created in the mining, transportation, and public service sectors. At full production and through the life of the mine, the proposed project is expected to create a total of 35 direct (mine, loading facility, and coal transportation) and 15 indirect (secondary) jobs (Table 4.7).

Employment by Type

The following sections describe the types and number of employees expected to be hired for construction and operations.

Mine Employment — YCC expects to hire nine employees for construction of the mine during the last two quarters of 1990 (Table 4.8). During the last year of construction (1991), approximately seven construction workers would be employed by YCC.

Mine operations should begin in late 1990, with 15 full-time employees working at the mine by the beginning of 1991. Following 1991, approximately one employee per year is expected to be added to the work force until 1994, when full operations employment would be attained (19 employees).

As illustrated in Table 4.8, YCC expects to hire nearly 100 percent of the construction workers and three-fourths of the operations workers locally (Billings Job Service area). Most positions could be filled by local applicants who would be trained on site. Positions which would require special expertise, such as the underground supervisor and some technical employees, would most likely be recruited from outside the study area.

Load-out Facility Employment — Five employees are expected to be hired for construction of the loading facility during the last two quarters of 1990 (Table 4.9). Construction should be completed by the end of 1990, when full operations would commence.

During mine operations, four employees would be hired for the first two years of operations and, in 1993, one employee would be added, bringing total employment at the loading facility to five employees (Table 4.9). YCC expects to hire 100 percent of the loading facility employees locally (Billings Job Service area).

Transportation Employment — YCC expects to contract with or hire approximately five employees during the first full year of production, two additional employees during the next year when production is increased by 100,000 tons, and two more in 1993 when production is increased again by 100,000 tons (Table 4.10). During full operations, eleven full-time persons would be employed in transportation including ten drivers and one mechanic.

TABLE 4.7

TOTAL EMPLOYMENT SUMMARY — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Employment Category	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Construction Employees	14	14	6	7	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employees	3	16	24	24	24	24	27	27	27	27	32	32	32	32	35	35	35	35	35	35	35	35
Secondary	0	5	11	11	11	11	11	11	11	11	11	14	14	14	14	15	15	15	15	15	15	15
Total	17	35	41	42	42	42	38	38	38	38	43	46	46	46	49	50	50	50	50	50	50	50

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.
Yellowstone Coal Company development estimates.

TABLE 4.8

MINE EMPLOYMENT — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Employment Category	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Construction Employment — Mine																						
Local Hire Ratio	.89	.89	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Administrative	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	1	1	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	6	5	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Operators	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Employment	9	9	6	7	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employment — Mine																						
Local Hire Ratio	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75
Administrative	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Technicians	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mechanics	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
Laborers	0	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Equipment Operators	0	5	10	10	10	10	12	12	12	12	13	13	13	13	14	14	14	14	14	14	14	14
Total Operations Employment	0	10	15	15	15	15	16	16	16	16	18	18	18	18	19	19	19	19	19	19	19	19
Total Mine Employment	9	19	21	22	22	22	16	16	16	16	18	18	18	18	19	19	19	19	19	19	19	19

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.

Yellowstone Coal Company development estimates.

TABLE 4.9

LOADING FACILITY EMPLOYMENT — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Employment Category	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Construction Employment — Loading Facility																						
Local Hire Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Administrative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Operators	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Employment	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employment — Loading Facility																						
Local Hire Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Administrative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Equipment Operators	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3
Total Operations Employment	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5
Total Loading Facility Employment	8	8	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.

Yellowstone Coal Company development estimates.

TABLE 4.10

TRANSPORTATION EMPLOYMENT — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

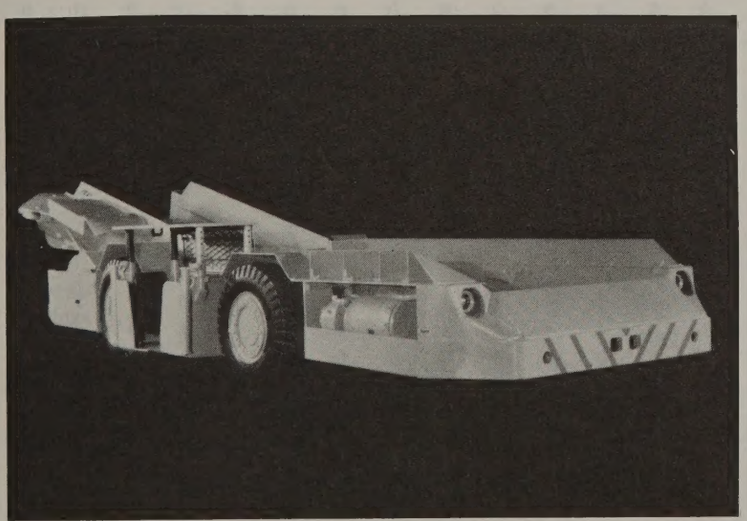
	1990		1991				1992				1993				1994				1995			
Employment Category	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Operations Employment — Transportation																						
Local Hire Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Administrative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Truck Drivers/Operators	0	2	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10	10	10	10	10
Total Transportation Employment	0	3	5	5	5	5	7	7	7	7	9	9	9	9	11	11	11	11	11	11	11	11

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.
Yellowstone Coal Company development estimates.

Based on YCC's data, the number of truck drivers needed to transport the coal from the mine to the Huntley load-out facility was estimated by assuming 0.5 million tons of coal would be transported using 45-ton trucks, yielding approximately 11,111 trips per year. Using 260-day work year, about 42 trips would be made per work day. Assuming one driver could make four round-trips per shift, the transportation of the coal during full operations would require approximately ten truck drivers. One mechanic would be required to support this number of trucks and drivers. It is expected that all transportation employees would be hired locally (within the Billings Job Service area) since there is an adequate supply of persons experienced in transportation services in both Musselshell County and Yellowstone County (Table 3.5).

EMPLOYMENT DISTRIBUTION

The following sections describe the geographical distribution of the employees to be hired by YCC during construction and operations.



10SC32A Shuttle Car
Photo courtesy Joy Technologies, Inc.

Expected Local Hire Distribution — The distribution of workers hired locally was allocated to Roundup, rural Musselshell County, Billings, and rural Yellowstone County (primarily the area between Billings, Huntley, and the northern Yellowstone County border). The allocation of local hire was approximately 70 percent for Billings, 20 percent for Roundup, and 5 percent each for rural Musselshell and Yellowstone counties. This allocation scheme was developed through interviews with personnel from the Billings Job Service Office and representatives of YCC. The allocation is also similar to the distribution of new workers to the area estimated by using a gravity model (Gary Lythgoe, Montana Job Service, Billings, Montana. Personal communication, March 1, 1989).

During the first year of operations (1991), YCC expects to employ approximately 24 persons (Table 4.7) of which 20 would be hired locally (Table 4.11). Of the 20 employees hired locally, 14 are expected to be from Billings, four from Roundup, and one each would come from rural Musselshell and Yellowstone counties (Table 4.11). During full operations, the distribution of the 30 workers hired locally is expected to be approximately 22 from Billings, six from Roundup, and one each from rural Musselshell and Yellowstone counties.

Expected In-migrating Workers Distribution — The distribution of expected in-migrating workers by general geographic area is illustrated in Table 4.12. The number and distribution of in-migrating workers was developed using company-supplied local hire ratios and the gravity model described in Appendix 12. The gravity model yielded the following distribution of mine workers to the area: 74 percent to Billings, 13 percent to Roundup, 6 percent to rural Musselshell County, and 7 percent to rural Yellowstone County. This distribution scheme indicates that, during full operations, four of the total five in-migrating mine workers would live in Billings and one would live in Roundup (Table 4.12). No in-migrating workers are expected to reside in rural Musselshell County or rural Yellowstone County.

Table 4.13 summarizes the expected final distribution of all mine-related workers including those that would be hired locally and those that would migrate into the area. During full operations, 26 of the mine-related employees are expected to reside in Billings, seven in Roundup, and one each in rural Musselshell and rural Yellowstone counties.

TABLE 4.11

LOCAL HIRE DISTRIBUTION — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Type of Employment by Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Construction																						
Roundup	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billings	11	11	5	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Roundup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Local Hire — Construction	13	13	6	7	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operations																						
Roundup	0	2	4	4	4	4	4	4	4	4	5	5	5	5	6	6	6	6	6	6	6	6
Billings	3	11	14	14	14	14	17	17	17	17	20	20	20	20	22	22	22	22	22	22	22	22
Rural Roundup	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rural Yellowstone	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Local Hire — Operations	3	13	20	20	20	20	23	23	23	23	27	27	27	27	30	30	30	30	30	30	30	30
Total Local Hire Distribution																						
Roundup	2	4	5	5	5	5	4	4	4	4	5	5	5	5	6	6	6	6	6	6	6	6
Billings	14	22	19	20	20	20	17	17	17	17	20	20	20	20	22	22	22	22	22	22	22	22
Rural Roundup	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rural Yellowstone	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Local Hire	16	26	26	27	27	27	23	23	23	23	27	27	27	27	30	30	30	30	30	30	30	30

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.12

IN-MIGRATING WORKER DISTRIBUTION — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Type of Employment by Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Construction																						
Roundup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billings	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Settlement	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operations																						
Roundup	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Billings	0	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Operations Settlement	0	3	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5
Total Migration																						
Roundup	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Billings	1	4	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Settlement	1	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.13

TOTAL MINE EMPLOYEE DISTRIBUTION — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Roundup	2	4	6	6	6	6	5	5	5	5	6	6	6	6	7	7	7	7	7	7	7	7
Billings	15	26	22	23	23	23	20	20	20	20	24	24	24	24	26	26	26	26	26	26	26	26
Rural Musselshell	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rural Yellowstone	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Settlement	17	30	30	31	31	31	27	27	27	27	32	32	32	32	35	35	35	35	35	35	35	35

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

Secondary Employment

In addition to the projected employment created directly by mine operations and coal transportation, the project is expected to stimulate economic activity and employment in various trade and public service sectors of the study area. This new employment created indirectly as a result of the project is called "indirect or secondary" employment.

For rural areas, such as Roundup and rural county areas, an employment multiplier of 0.25 during construction and 0.4 during operations was found to be an average ratio of indirect to new direct employment (Gilmore, *et al.*, 1982). For more urban areas, such as the Billings area, an employment multiplier of 0.35 during construction and 0.5 during operations was found to be an average ratio of indirect to new direct employment. Based on these multipliers, should the mine operations and coal transportation create 35 direct jobs at full production, then approximately 15 secondary jobs also would be created. Because secondary jobs typically do not require extensive training or specialized education, they probably would be filled by the local labor force. A local hire ratio of 90 percent was utilized to estimate expected secondary employment in-migration to the study area.

During full operations, demand from direct mine employees is expected to create two new secondary jobs in Roundup and 13 new secondary jobs in Billings (Table 4.14). Only one secondary worker is expected to migrate into the study area and the remaining 14 are projected to be hired from the local labor force.

Income

Income (payroll) from the mine and secondary jobs was estimated and is presented in Table 4.15. Projections of secondary income were derived by multiplying the number of secondary workers by an estimated weekly salary of $216. This figure is based on a statewide average of services-related employees reported by the Montana Department of Labor and Industry.

Total wages and salaries should be about $887,480 during full operations. Approximately $719,000 of this income would come

TABLE 4.14

TOTAL SECONDARY WORKER DISTRIBUTION — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1995)

	1990		1991				1992				1993				1994				1995			
Employment Distribution	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
In-Migrating Distribution																						
Roundup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billings	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total In-Migrating	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Local Hire Distribution																						
Roundup	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Billings	0	5	10	9	9	9	9	9	9	9	9	11	11	11	11	12	12	12	12	12	12	12
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Local Hire	0	5	10	10	10	10	10	10	10	10	10	13	13	13	13	14	14	14	14	14	14	14
Total Secondary Distribution																						
Roundup	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Billings	0	5	11	10	10	10	10	10	10	10	10	12	12	12	12	13	13	13	13	13	13	13
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Secondary Distribution	0	5	11	11	11	11	11	11	11	11	11	14	14	14	14	15	15	15	15	15	15	15

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.15

PAYROLL BY SOURCE — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1996)

Type of Income	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*
Direct Income							
Mine	$188,000	$424,000	$336,000	$385,000	$416,000	$416,000	$416,000
Loading Facility	78,000	56,000	56,000	75,000	83,000	83,000	83,000
Transportation	31,000	100,000	140,000	180,000	220,000	220,000	220,000
Total Direct Income	$297,000	$580,000	$532,000	$640,000	$719,000	$719,000	$719,000
Indirect Income	$16,848	$123,552	$134,784	$151,632	$65,672	$168,480	$168,480
Total Income	$313,848	$703,552	$666,784	$791,632	$884,672	$887,480	$887,480
Annual Income (Per Worker)							
Direct Workers	$25,277	$18,862	$19,704	$20,000	$20,543	$20,543	$20,543
Indirect Workers	$11,232	$11,232	$11,232	$11,232	$11,232	$11,232	$11,232

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

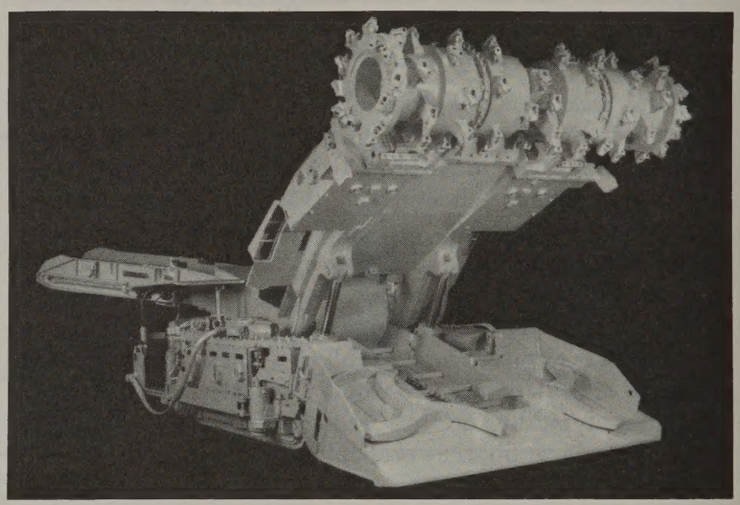
directly from the mine, while $168,480 would come from secondary jobs. Since many of the workers are expected to reside in the Billings area, the majority of this income would most likely be spent in Yellowstone County.

Other income to the area would be from expenditures by the coal company for supplies and equipment and from the transportation contractor for fuel, repairs, and other supplies. Most of the mining equipment would be bought outside the study area. Since the trucking firm would be a contractor, it is not known where the firm would purchase their trucks or trailers. The expected local purchases by the mining company should average $1.0 million per year estimated on an average supply cost of $2 per ton of coal (Bob Morehead, personal communication, May 11, 1989).

Fiscal

Local Government Costs — The major cost to Musselshell County would be the maintenance of the Old Divide Road. The Old Divide Road is a two-lane road that may not sustain the type of traffic that is projected to occur under this mining scenario. The State of Montana provides maintenance on the highways between the project site and the Huntley load-out facility. Thus, Yellowstone County should experience minor increased costs with respect to the road system in Yellowstone County. The increase in traffic may require additional services from both the sheriff's department and ambulance service providers; however, no new personnel or capital costs are anticipated.

One new family is projected to migrate into Musselshell County (see Demography impacts), which is not expected to add any costs to the budget of the Musselshell County or Roundup governments. Similarly, five new families are projected to migrate into Yellowstone County which should not add any costs to the budget of Yellowstone County or Billings governments. The small number of children expected to migrate into the study area is not expected to appreciably affect the budgets of any of the school districts within the study area (see Demography impacts).



12CM12 Continuous Miner
Photo courtesy Joy Technologies, Inc.

State and Federal Government Costs

The major cost to the State of Montana would be the increased maintenance of U.S. Highway 87 and U.S. Highway 312 (the Huntley Road) within the study area. Furthermore, the life of the road may be shortened due to the increased traffic (see Transportation impacts). However, to offset these impacts, indirect revenues would be generated through diesel fuel taxes, Gross Vehicle Weight (GVW) fees, and Federal use fees paid by the trucking firm.

Federal costs due to the land exchange would amount to foregone royalty payments, assuming YCC would be willing to lease the property (see leasing socioeconomics). Similar to Meridian Minerals, BLM holds properties that checkerboard the Bull Mountains area. It is unknown whether third party mining companies would be interested in leasing both the Federal and private coal and paying royalties to both the Federal government and Meridian.

Local Government Revenues

Musselshell County government is expected to receive approximately $100,000 per year for the first five years of the project (Table 4.16). Most of the new revenue would be from taxes on the gross proceeds of the coal. In 1996, production is expected to shift to Yellowstone County and, consequently, a major shift in taxable valuation of the coal to Yellowstone County would occur at that time.

Beginning in 1996, Yellowstone County should receive slightly over $172,000 per year in taxes due to the project. No coal production is projected for Musselshell County from 1996 to 2038; therefore, revenues to Musselshell County would be minimal during this time period.

Revenues to the Roundup Elementary School District average approximately $50,000 per year and the High School District should receive approximately $40,000 per year through the first five years of operations. By 1996, when production changes to Yellowstone County, revenues are expected to decline to approximately $5,000 per year for each of the elementary and high school districts. In 1996, revenues to the Yellowstone County School Districts would increase markedly due to taxation on gross proceeds of coal mined in Yellowstone County (Table 4.16 and Appendix 13). Recently enacted school funding legislation by the Montana legislature would cause minimal change to these estimates.

Minor local governmental revenues that are expected, but not listed in Table 4.16, are: school foundation program revenues for every new child enrolled in public schools, increased property valuation due to new home construction, and increased property valuation on new business or business expansion due to the in-migrating population.

The net effect of the project on local governments within the study area should be positive since, in most cases, revenues are expected to exceed expenditures. The possible exception would be maintenance of the Old Divide Road by Musselshell County since, by 1996, revenues from the project to Musselshell County may decrease below the projected costs of maintaining this road.

State and Federal Government Revenues

During full production, the State of Montana should receive an estimated $450,000 per year in additional revenues from taxes on the mine and payrolls of the mine and the secondary workers (Table 4.17). Federal revenues are expected to exceed $500,000 per year by full operations (Table 4.17). Other State and Federal revenues that are expected, but not listed in Table 4.17, include corporate taxes paid by the mining company and GVW and Federal use fees paid on the trucks (Appendix 13).

Social Environment

Demography

The average family size of in-migrating workers depends not only on demographic characteristics of the workers (percent married with families, number of children present), but also on the particular phase of the mine development (construction or operations) at the time of in-migration. Several monitoring studies and surveys (Mountain West Research, 1975; Leholm, *et al.*, 1975; Wieland, *et al.*, 1977) indicate that in mineral and

TABLE 4.16

PROJECTED LOCAL GOVERNMENT REVENUES — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1991 TO 1997)

Type of Revenues	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Musselshell County Government							
Gross Proceeds	$29,200	$58,400	$87,600	$116,800	$116,800	$ 0	$ 0
Mine & Equipment	13,350	13,981	14,691	15,475	15,395	11,507	11,344
Total	$42,550	$72,381	$102,291	$132,275	$132,195	$11,507	$11,344
Roundup Elementary School							
Gross Proceeds	$15,588	$31,177	$46,765	$62,353	$62,353	$ 0	$ 0
Mine & Equipment	7,135	7,471	7,851	8,270	8,227	6,150	6,063
Total	$22,723	$38,648	$54,616	$70,623	$70,580	$6,150	$6,063
Roundup High School							
Gross Proceeds	$12,412	$24,823	$37,235	$49,647	$49,647	$ 0	$ 0
Mine & Equipment	5,681	5,949	6,251	6,585	6,551	4,897	4,827
Total	$18,093	$30,772	$43,486	$56,232	$56,198	$4,897	$4,827
Yellowstone County Government							
Gross Proceeds	$ 0	$ 0	$ 0	$ 0	$33,600	$168,000	$168,000
Loading Facility	682	665	648	632	1,391	4,067	3,644
Total	$682	$665	$648	$632	$34,991	$172,067	$171,644
Yellowstone County Schools							
Gross Proceeds	$ 0	$ 0	$ 0	$ 0	$55,600	$278,000	$278,000
Loading Facility	1,127	1,099	1,072	1,045	2,299	6,722	6,023
Total	$1,127	$1,099	$1,072	$1,045	$57,899	$284,722	$284,023

Note: Gross proceeds projected assuming $15 per ton coal. See Appendix 13 for assumptions relating to this table.

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.17

PROJECTED STATE AND FEDERAL REVENUES — 0.5 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1997)

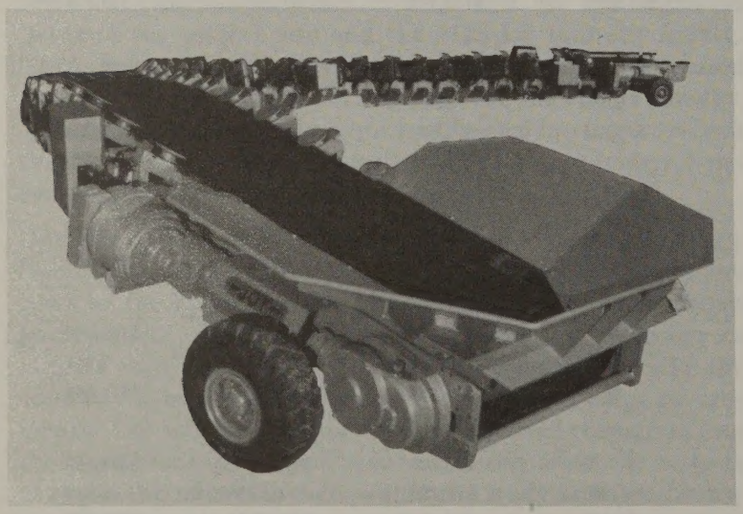
Type of Revenues	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
State of Montana Revenues							
Coal Severance Tax	$42,080	$94,680	$147,280	$199,880	$251,180	$246,240	$246,240
RIT Tax	7,500	15,000	22,500	30,000	37,500	37,500	37,500
Individual Payroll	24,624	23,337	27,707	30,964	31,062	31,062	31,062
Diesel Fuel Taxes	7,111	14,222	21,333	28,444	35,556	35,556	35,556
Property Taxes (Schools)	30,247	49,934	69,686	89,495	109,154	107,915	107,495
Total	$111,562	$197,174	$288,506	$378,783	$464,452	$458,272	$457,852
Federal Revenues							
Individual Payroll	$64,727	$61,344	$72,830	$81,390	$81,648	$81,648	$81,648
Diesel Fuel Taxes	5,369	10,738	16,107	21,476	26,844	26,844	26,844
Abandoned Mine Tax	15,000	30,000	45,000	60,000	75,000	75,000	75,000
Black Lung Tax	66,000	132,000	198,000	264,000	330,000	330,000	330,000
Total	$151,096	$234,082	$331,937	$426,865	$513,493	$513,493	$513,493

Note: Gross proceeds projected assuming $15 per ton coal. See Appendix 13 for assumptions relating to this table.

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

energy-related developments, the number of dependents accompanying the worker, and consequently the overall family size for in-migrating workers, is 20 to 30 percent less for construction than for operational workers. In a comparison of related worker characteristics for North Dakota mines, it was found that the family size for in-migrating construction workers was 2.24 compared to 3.37 for in-migrating operational workers (Leholm, *et al.*, 1975). The primary reason for this smaller family size of construction workers is that many families of construction workers often do not accompany their spouse to the study area because of the short duration of construction. The construction worker either commutes to the project site or establishes a temporary residence in the study area during the construction phase and the family remains at the place of permanent residence.

Average family size of construction workers and secondary workers for this project were assumed to be 2.1, while family size for operations employees were assumed to be 3.1. Slightly larger family sizes (3.3) have been used in past environmental impact statements; however, these figures were based upon studies conducted in the middle and late 1970s, when family sizes were larger than currently being reported. Today's family sizes tend to be smaller because of the decline in fertility rates since the 1960s.



3FCT Flexible Conveyor Train
Photo courtesy Joy Technologies, Inc.

The number of school-aged children (children between the ages of 0 and 18 living at home) accompanying in-migrating workers was estimated using ratios developed based on 1987 Montana school statistics and on the estimated number of children 18 years old and younger living in the state during 1987. Based on this data, it is estimated that about 45 percent of the children 18 years old and younger are enrolled in grades kindergarten through 8, approximately 19 percent of the children are enrolled in high school, about 35 percent are not enrolled in school, and about 1 percent are ungraded or enrolled in special education.

The production scenario of mining 0.5 million tons of coal per year would provide about nine new jobs (seven direct and two secondary) for Roundup residents, 39 new jobs (26 direct and 13 secondary) for Billings residents, and two additional jobs for rural residents of Musselshell and Yellowstone counties (see Appendix 14 for a more detailed breakdown). Most of the jobs would be filled by the local available work force; however, some in-migration of workers and their families would take place. During peak construction of the proposed project, Billings would be the only area to experience in-migration (Table 4.18). It is projected that one construction worker would move to Billings to work at the mine. No spouse or children are assumed to accompany the worker.

Rural Musselshell and Yellowstone counties would experience no increase in mine-related population during full mine operations under the 0.5 million tons per year production scenario. One mine worker accompanied by a spouse and one elementary school-aged child would move to Roundup during full operations. An estimated four direct workers and one secondary worker would move to Billings during full operations (Table 4.18). In addition to the five workers, it is assumed that the in-migrating population to Billings would include three spouses,

TABLE 4.18

PROJECTED IN-MIGRATION TO THE STUDY AREA — 0.5 MILLION TONS MINE PRODUCTION SCENARIO

	Rural Musselshell County		*Roundup*		*Rural Yellowstone County*		*Billings*	
Expected In-Migration	*Peak Construction*	*Full Operations*	*Peak Construction*	*Full Operations*	*Peak Construction*	*Full Operations*	*Peak Contruction*	*Full Operations*
Mine-related Workers	0	0	0	1	0	0	1	4
Secondary Workers	0	0	0	0	0	0	0	1
Spouses	0	0	0	1	0	0	0	3
Children — Total	0	0	0	1	0	0	0	5
K-8	0	0	0	1	0	0	0	3
9-12	0	0	0	0	0	0	0	1
Not in School	0	0	0	0	0	0	0	1
Total	0	0	0	3	0	0	1	13

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

three children in grades kindergarten through 8, one high school-aged child, and one child not enrolled in school, a total of 13 people moving into Billings.

It is concluded that, under the 0.5 million tons per year mining scenario, there would be no significant impacts with respect to demographic characteristics on any areas in the study area. The small number of in-migrating population would be assimilated into the existing population without impacts to the demographic characteristics of the study area.

Social Life

The magnitude of potential impacts on community resources, social organization, and social well-being would depend upon the scale of development (e.g., number of new jobs and number of newcomers to the area) and the ability of the community to accommodate or adapt to changes elicited by the project. The ability of the community to accommodate social change is related to the perceptions and expectations of the community in regard to the proposed coal mining; past history of coal and other resource developments in the area; availability and adequacy of community resources; and the socioeconomic heterogeneity of the affected population.

The principal impacts that would result from providing coal through the land exchange would be fiscal (highway maintenance); however, social impacts also may occur because some area residents perceive that a land exchange may create a coal and transportation monopoly. Those who oppose the land exchange because of their fear of a coal and transportation monopoly could be adversely affected (angry, upset, stressed, etcetera) because they perceive that the government may be collaborating with industry to facilitate and expedite coal development.

Social life in the Roundup area would only be affected by the project to the extent that many area residents have high expectations that the proposed project would revitalize the depressed economy of Musselshell County. The small numbers of new jobs and in-migrants with this alternative, however, would not provide a significant infusion of wages into the local economy.

Community Services

The expected low number of workers, families, and secondary employment that would come into both Yellowstone and Musselshell counties would have no significant impact on community services. Both Billings and Roundup have experienced out-migration of population due to declines in the economies associated with oil, coal, and agriculture. Because of population declines in recent years, the community services of Roundup are being utilized below capacity. The expected small numbers of in-migrants would not stress the capacity of existing community service providers such as schools, hospitals, fire protection, or other services.

Law enforcement and the county road department are currently not adequately staffed. The transport of coal by truck from the mine to the Huntley siding would stress traffic patrol, enforcement, and emergency services. Due to the projected increase in traffic, officers may have to commit more time and resources to patrolling U.S. Highway 87. This demand would shift enforcement and patrol duties from other portions of the county to the coal hauling route. Residents experiencing reduced law enforcement could view this community resource to be not allocated equitably.

It is concluded that the small number of in-migrants into the study area with the 0.5 million tons per year scenario would elicit minor impacts to community services in the area.

Housing

Although rental housing is limited in the Roundup area, there are an adequate number of houses for sale to accommodate the projected number of in-migrants (one family) to the Roundup area. Homeowners who have not been successful in the sale of their home may offer their homes for rent. In the Billings area, there is a sufficient number of rentals and homes for sale to accommodate the predicted number of in-migrating operations workers (five families) under the 0.5 million tons per year scenario.

Transportation

Assumptions

Based on YCC's data, the coal would be transported from the mine site to Huntley, Montana, using 45-ton trucks. The first year production level of 100,000 tons would require, at a minimum, two trucks with approximately ten round-trips per day for 260 days per year. In an eight hour day, this would require a truck leaving the mine site approximately every 48 minutes (Table 4.19). With two trucks, this would necessitate one round-trip every 96 minutes. More than likely, given the size of the trucks and the traveling distance, the round trip would require approximately two hours. Thus, the hauling day would probably be closer to ten hours for each of the drivers.

The following year, when production increases to 200,000 tons, the number of trucks would double, and the trip frequency would increase to one truck every 24 minutes. These schedules are based on an eight-hour day. By increasing the work day to 12 or 14 hours, more dispersed trips to and from the loading facility could be scheduled (Table 4.19). For example, with a production level of 0.5 million tons per year and a 12-hour work day, one truck would leave the mine site and the Huntley loading facility approximately every 14 minutes (Table 4.19). Under the same production level, if trucks were to haul coal 24 hours a day, a truck would leave every 29 minutes.

In addition to the aforementioned truck traffic, there would be commuter and other minor hauling traffic (e.g., supplies, solid waste) associated with the project. Of the 35 full-time employees, 26 are expected to reside in or near Billings. Assuming 1.5 commuters per vehicle, this would imply that there would be an additional 17 round-trips per day in commuter traffic on U.S. Highway 87.

TABLE 4.19

INTERVALS AT WHICH TRUCKS WOULD LEAVE THE MINE SITE AND LOADING FACILITY — 0.5 MILLION TONS MINE PRODUCTION SCENARIO

Annual Production Level	*Day Length of Hauling*			
	8 Hours	*12 Hours*	*16 Hours*	*24 Hours*
100,000	48 minutes	72 minutes	96 minutes	144 minutes
200,000	24 minutes	36 minutes	48 minutes	72 minutes
300,000	16 minutes	24 minutes	32 minutes	48 minutes
400,000	12 minutes	18 minutes	24 minutes	36 minutes
500,000	10 minutes	14 minutes	19 minutes	29 minutes

Note: Table assumes 45-ton trucks, 2-hour round-trip, and 260-day work year.

Source: Economic Consultants Northwest, Helena, 1989b.

Traffic

The following discussion is based upon excerpts from letters from the Montana Department of Highways (Don Cromer, personal communication, March 1 and March 20, 1989).

Capacity

In general, the roadway "capacity" is the estimated traffic-carrying capabilities of a roadway over a range of defined operational conditions. These operational conditions are defined by using the concept of "level-of-service" (LOS). LOS for a particular section of roadway is a qualitative measure that describes operational conditions within a traffic stream and the perception of these conditions by motorists and/or passengers. Factors such as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety are general considerations involved in LOS. The best service is designated as LOS"A", while the worst is designated as LOS"F" at which point traffic flow breaks down.

Current estimated ratings of the proposed haulage route are "B" for U.S. Highway 87 (except for a two-mile stretch which is rated "C") and a high "C" rating for most of U.S. Highway 312 (Huntley Road). During full production, MDOH expects that three segments of the proposed haulage route would experience a reduction in their LOS rating due to the increased truck traffic.

The locations where the level of service may be decreased are a 11.4 mile stretch of roadway on U.S. Highway 87 approximately 11.8 miles north of the junction of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) (from a "B" rating to a "C" rating); a 4.5-mile stretch of roadway on U.S. Highway 87 approximately 25.1 miles north of the U.S. Highway 87/U.S. Highway 312 junction (from a "B" rating to a "C" rating); and, during peak traffic periods, the intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) (from a current "C/D" rating to an "E" rating). The two segments of U.S. Highway 87 which are projected to decrease in LOS ratings are scheduled for reconstruction between 1991 and 1993 and, following reconstruction, the LOS rating of these roadways would be a "B" rating even with the additional mine traffic.

The intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) is the most critical link in the haulage route for LOS considerations. The left turning movement through this intersection would take a long time to complete for the coal trucks and would severely restrict left turns from the southbound lane of U.S. Highway 87. This critical situation is a result of the high number of commercial vehicles turning left from a stop sign through a high volume of unstopped traffic moving west and east through the intersection from Billings and Huntley, respectively. Furthermore, because of the geometry of the intersection, it may be difficult for trucks of the proposed configuration to accomplish this maneuver. Analysis also indicates that the movement through the intersection cannot be improved by simply dedicating an outside southbound lane of U.S. Highway 87 to left turns only. Alternatives for improving the projected LOS rating of the intersection would be signalization of the intersection (at a cost of between $50,000 and $100,000) or selective scheduling through the intersection. Analysis indicates selective scheduling would raise the LOS rating of the intersection from an "E" back to the current rating of "C/D" (Don Cromer, personal communication, March 20, 1989).

Safety

Traffic safety studies performed by MDOH indicate that accident rates for large trucks are proportional to the mix of these vehicles in the traffic stream. This implies that the percentage of accidents involving large trucks as well as the overall accident rate on U.S. Highway 87 would increase as a result of the proposed transportation scenario. MDOH projects that the number of accidents involving large trucks may increase 30 percent from the proposed project.

Of special concern to MDOH are potential accident sites at the following intersections/segments:

(1) The angle of intersection between the Old Divide Road and U.S. Highway 87 is such that drivers turning left from this road onto U.S. Highway 87 would have impaired visibility to the north.

(2) The intersection of U.S. Highway 87 with U.S. Highway 312 (Huntley Road-K-Mart corner) would experience increases in accidents from coal trucks making the left turn movement from U.S. Highway 87.

(3) The accident rate on U.S. Highway 312 (Huntley Road) would be worsened. Of special concern is the curve near the junction to Shepherd and the Shepherd junction itself. Both of these locations have a high potential for increased accident rates.

Roads and Bridges

The pavement conditions for the proposed haulage routes would deteriorate at an accelerated rate under the proposed transportation scenario. MDOH currently has three construction projects scheduled for U.S. Highway 87 between 1990 and 1993. The additional use attributable to the proposed coal haulage may necessitate the addition of either crushed base materials or plant mix to preserve the structural integrity of the roadway (Don Cromer, personal communication, March 1, 1989). Reconstruction projects on U.S. Highway 87 would require an additional 0.40 feet of crushed base course ($70,000 per mile) or an additional 0.15 feet of plant mix ($78,000 per mile) in order for U.S. Highway 87 to maintain its structural integrity.

Annual maintenance costs would increase for all sections of the proposed haulage route due to increased truck movement. In addition, the increased use probably would cause the failure of either of the roadways earlier than the projected designed life for the planned projects on U.S. Highway 87. The additional use may necessitate reconstruction of 7.5 miles of U.S. Highway 87 and overlaying ± 17.5 miles of roadway on or before year 2005. MDOH estimates that the proposed project would increase maintenance costs on U.S. Highway 87 by approximately $50,000 per year and that the maintenance costs on U.S. Highway 312 (Huntley Road) would increase by approximately $90,000 to $100,000 annually. To some extent, maintenance costs would be indirectly alleviated through diesel fuel taxes, Federal use fees, and GVW fees paid by the trucking firm.

Bridge structures on the proposed haulage route currently have sufficiency and load ratings that are adequate to accommodate the proposed coal haulage (Don Cromer, personal communication, March 1, 1989). However, narrow structures on U.S. Highway 312 (Huntley Road) may need to be reconstructed to improve safety.

SCHOOL BUS ROUTES

There are currently eleven school bus routes within the proposed transportation route. These buses are on the routes for approximately 1½ hours in the morning and in the afternoon. In addition, some of the schools operate buses on the route on a different schedule one day a week.

Local school officials have expressed concern about the safety of school children on buses that operate on the same transportation route as the proposed coal haulage route (Jay Erdie, personal communication, March 13, 1989). These concerns are related to the frequent stops a school bus must make on a route and the safety of the children as they embark or disembark from the buses.

MDOH compared proposed traffic volumes on U.S. Highway 87 with other Montana highways near schools or on school bus routes. MDOH found that none of the other highways had accident clusters that specifically involved accidents associated with school activities or school bus transportation. However, the potential for increased traffic accidents involving school children would exist because of the increased traffic related to the proposed mine development (Don Cromer, personal communication, May 4, 1989).

Air Quality

Climate

The exchange will have no effect on the climate of the area. If the property is developed by a mining company for coal, the result will also have little or no effect on the climate of the area.

Air Quality

The exchange will have no effect on the air resources of the area. Possible plans by a mining company to open a 0.5 million tons per year underground coal mine were examined as to the effect on the air resources. The resulting air pollutant emissions from the mining and cleaning process are shown in Tables 4.20 through 4.22. The air separator process used in the 0.5 million tons per year mine is one of the largest contributors to the particulate emissions. In order for the mining company to ship 0.5 million tons of clean coal, it will have to mine 0.7 million tons of raw coal. From this analysis, total suspended particulates and PM-10 particulates will have the maximum emissions. Total suspended particulate emissions are estimated to be 71.3 tons per year. PM-10 particulate emissions would be 52.2 tons per year. The maximum gaseous emissions will be nitrogen oxides, approximated to be 15.6 tons per year. In calculating the emission estimates, it was assumed that the mine would utilize the Best Available Control Technology as required by Montana regulations. Therefore, the effect of the exchange, should an underground mine of the 0.5 million tons per year size be built, would be that the particulate levels would increase above the present baseline. However, the air quality levels would still be well within the allowable concentrations under both Federal and Montana standards.

TABLE 4.20

BULL MOUNTAINS MINE (0.7 Million TPY Raw Coal)
(0.5 Million TPY Clean Coal)
TOTAL SUSPENDED PARTICULATE EMISSIONS

Activity	*Uncontrolled Emissions (TPY)*	*Controlled Emissions (TPY)*
MINE AREA		
1. Mine Ventilation Exhaust	0.94	0.94
2. Dumping Run of Mine (ROM)	4.46	4.46
3. Conveying, Screening ROM	70.00	0.70
4. Primary Roll Crusher	6.00	0.06
5. Pneumatic Coal Cleaning	—	33.79
6. Coal Storage	11.83	11.83
7. Load Coal For Transport	3.82	3.82
TRAIN LOADOUT		
1. Dump Coal At Loadout	3.82	3.82
2. Train Loadout	0.06	0.06
3. Coal Stockpile	11.83	11.83
TOTAL	112.76[1]	71.31

[1]Total uncontrolled emissions do not include pneumatic coal cleaning.
Source: Gelhaus, James M., February 1989.

TABLE 4.21

BULL MOUNTAINS MINE (0.7 Million TPY Raw Coal)
(0.5 Million TPY Clean Coal)
PM-10 SUSPENDED PARTICULATE EMISSIONS

Activity	*Uncontrolled Emissions (TPY)*	*Controlled Emissions (TPY)*
MINE AREA		
1. Mine Ventilation Exhaust	0.94	0.94
2. Dumping Run of Mine (ROM)	2.14	2.14
3. Conveying, Screening ROM	25.20	0.25
4. Primary Roll Crusher	2.16	0.02
5. Pneumatic Coal Cleaning	—	33.79
6. Coal Storage	5.68	5.68
7. Load Coal For Transport	1.84	1.84
TRAIN LOADOUT		
1. Dump Coal At Loadout	1.84	1.84
2. Train Loadout	0.03	0.03
3. Coal Stockpile	5.68	5.68
TOTAL	45.51[1]	52.21

[1]Total uncontrolled emissions do not include pneumatic coal cleaning.
Source: Gelhaus, James M., February 1989.

TABLE 4.22

BULL MOUNTAINS MINE (0.7 Million TPY Raw Coal)
(0.5 Million TPY Clean Coal)
GASEOUS POLLUTANT EMISSIONS

Activity	*Sulfur Oxide TPY*	*Carbon Monoxide TPY*	*Hydrocarbons TPY*	*Nitrogen Oxides TPY*
Explosives	0.15	5.02	—	1.28
Diesel Fuel	1.56	6.18	1.04	14.30
TOTAL	1.71	11.20	1.04	15.58

Source: Gelhaus, James M., February 1989.

Cultural Resources

Development and operation of a 0.5 million tons per year coal mine will primarily create impacts to cultural resource properties outside the affected environment. Direct impacts to the selected Federal coal lands will occur only during a drilling/exploration program. The major cause of probable expected cultural resource impacts will be through subsidence. Mixing of soil horizons and subsurface deposits of multiple stratified prehistoric occupations is possible and could occur at the margins of subsidence areas (Robert Bohman, Geologist, Montana Department of State Lands, Billings, Montana. Personal communication, June 30, 1989). Major impacts to rock art sites can be expected due to scaling and collapse of vertical sandstone outcrops in subsidence areas and at subsidence margins. Such displacement can also be expected through the ongoing vibrations from underground operations, e.g. explosives, if used. No impacts are expected at other cultural resource property types.

Topography and Soils

The topography will be impacted primarily from sinkhole subsidence. These "sinkholes" and impacts will be minor and primarily in areas with less than 40 feet of overburden. Soils will be impacted slightly, primarily from sinkholes. Sinkholes may cause slope failure and surface fissures which may alter the soil structure, infiltration and permeability rates to a limited extent, as a result of mixing of surficial soil horizons, and alter drainage patterns in the area around the sinkholes.

Vegetation

Vegetation will be unaffected by mining except at the entrance and air vents.

Wildlife

There will be a certain amount of wildlife displacement associated with mine-mouth activities. There will also be some disturbance to local wildlife populations associated with haul-road activities. However, there will be no apparent adverse changes in wildlife habitat quality or use of the area.

Hydrology

No surface water impacts are anticipated since all drainages present are small ephemeral channels. Groundwater impacts are considered to be minimal, regardless of extraction method, although room and pillar mining would probably be used where overburden thicknesses are less than 200 feet. (Map 10).

Mining occurs primarily outside of where the Mammoth coal is saturated, with the water table of the deep aquifer system occuring within underburden sands. The limited extent of mining at or below the water table, and low hydraulic conductivities of materials involved, tend to preclude major dewatering and subsequent temporary lowering of the water levels of the deep aquifer that potentially could affect domestic wells southwest of the project area. No wells in current use have been identified within the area to be mined under this scenario.

Springs present within the area of mine impact are associated with overburden sand outcrops that are stratigraphically 300 or more feet above the Mammoth coal. Because 50 to 70 percent of the overburden section is comprised of shales and fine-grained siltstones, and due to the perched nature of the aquifer sands related to these springs, they are considered to be well insulated from both subsidence impacts (fracture development and/or roof caving) and deep aquifer dewatering.

Subsidence effects are minimized due to dry coal conditions. Locally, small room and pillar underground workings are present at Mammoth coal outcrops that show no subsidence over a 30 to 50 year period.

Use of the room and pillar extraction method in areas of relatively shallow overburden, under 200 to 300 feet (Map 10), has potential for long-term impacts that are not easily characterized at the present time. This is mostly true of those expanded areas where regional water levels would inundate pillars. Over time the effect of load pressures greater than hydraulic pressures, and concomitant weakening of pillar material through combined solution and physical sapping, could result in sinkhole collapse of unpredictable magnitude, location and extent. Appendix 5 contains a more in-depth discussion of the predictability of subsidence.

Recreation

Most recreational activities or opportunities will remain about the same except for hunting. With the increase in man's activity, it is anticipated that some wildlife species will move out of the area thus hunting opportunities will decrease somewhat. Other types of recreational opportunities will be affected minimally. Overall, recreational impacts would be insignificant and limited by the large amount of private ownership of the surface lands.

Stratigraphy and Geology

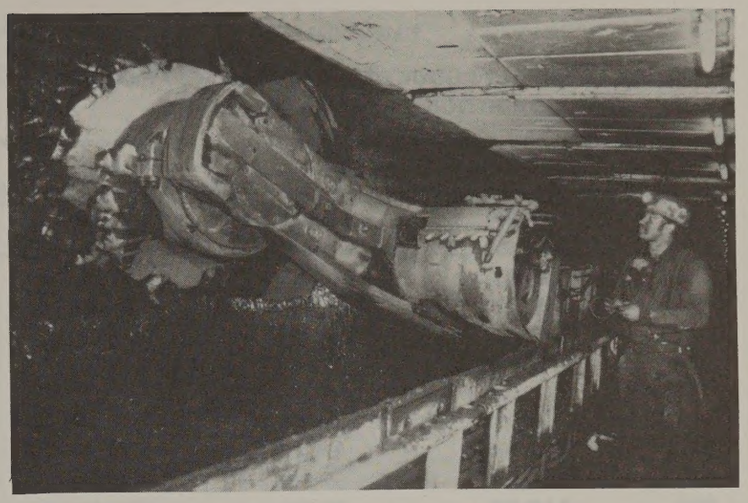
Approximately 50 percent of the Mammoth coal bed will be removed within the mine area.

Subsidence

Past mining and empirical estimates show that subsidence over most of the proposed room and pillar mining area in the Bull Mountains will not be a noticeable problem. There is some chance that room and pillar mining under shallow overburden, less than 40 feet, will result in sinkhole subsidence necessitating repair. Appendix 5 contains a more in-depth discussion of subsidence.

3.0 Million Tons Of Coal Per Year Mine

Development of the selected Federal coal lands as a longwall mine producing 3.0 million tons of coal per year is considered the maximum development to occur in the Bull Mountains. If the longwall mine was developed, it would necessitate the building of a railroad spur to haul the coal to the load-out facility. Two proposed routes were addressed previously, as well as the anticipated impacts of building the railroad.



3LS Longwall Shearer in action
Photo courtesy Joy Technologies, Inc.

RESOURCES NOT IMPACTED

The longwall mining operation will have minimal or no impacts to the following resources:

- Areas of Critical Environmental Concern
- Floodplains
- Native American Religious Concerns
- Threatened and Endangered Species
- Hazardous Wastes
- Wetlands/Riparian Areas
- Wild and Scenic Rivers
- Wilderness
- Other Minerals
  - Oil and Gas
  - Mineral Materials/Mining Claims

RESOURCE IMPACTS

Anticipated impacts from mining to the other resource values are as follows.

Socio-Economics

Economic Environment

Project Assumptions

The proposed coal mine would be an underground coal mine operated by Meridian Minerals Company located in southern Musselshell County and northern Yellowstone County. Construction of the mine would commence in July 1990, and production would begin in 1991 and increase steadily until 1994, when the mine is expected to be at full production (Table 4.23). The project would produce an estimated 3.0 million tons of coal per year and, during full production, would employ approximately 207 mine-related workers.

It is assumed that coal contracts would be negotiated with out-of-state utilities and coal would be shipped by rail to the utility site. Since there are no rail facilities near the mine site in Musselshell County, the coal produced from the proposed mine would initially be transported by truck from the mine site to a rail load-out facility in Huntley, Montana.

TABLE 4.23

PROJECTED COAL PRODUCTION — 3.0 MILLION TONS MINE PRODUCTION SCENARIO (Tons of Coal)

Tear	*Tellowstone County*	*Musselshell County*	*Total*
1991	72,000	453,000	525,000
1992	317,000	683,000	1,000,000
1993	287,000	1,813,000	2,100,000
1994	297,000	2,703,000	3,000,000
1995	455,000	2,545,000	3,000,000
1996	545,000	2,455,000	3,000,000
1997-2000	1,062,000	1,938,000	3,000,000
2001-2005	1,589,000	1,411,000	3,000,000
2006	2,764,000	236,000	3,000,000
2007	2,349,000	651,000	3,000,000
2008	2,149,000	851,000	3,000,000
2009	2,149,000	851,000	3,000,000
2010	690,000	690,000	1,380,000

Note: The projected coal mining production information submitted by Meridian Minerals Company only carried their figures on their 3.0 million tons per year mine production scenario out to 20 years. Most socioeconomic impacts would be realized after 20 years of mining.

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.

Meridian Minerals Company development estimates.

Beginning in the third quarter of 1991, construction of a railroad spur would commence from the mine site to the Burlington Northern mainline railroad. Construction would continue for two years and, upon completion of the railroad spur, coal would be transported entirely by rail. Rail transport would be scheduled to begin by mid-1993, when production would reach 2.1 million tons.

Economic impacts due to the land exchange and subsequent operation of the mine are described in terms of impacts on employment, income, and the fiscal conditions of local, State, and Federal governments.

Employment

As a direct result of the proposed land exchange and subsequent operation of the underground coal mine, employment opportunities would be created in the mining, transportation, and public service sectors. At full production and through the life of the mine, the proposed project is expected to create a total of 207 direct (mine, loading facility, and coal transportation) and 92 indirect (secondary) jobs. Employment would increase from an initial hiring of 35 to 65 construction and operations employees in 1990, to full employment of 207 employees by 1994 (Table 4.24). Construction employees would begin work in the third quarter of 1990 and continue construction work through 1993. Maximum construction employment of 38 employees would be attained in 1993 during construction of the railroad spur.

Employment by Type

The following sections describe the types and number of employees expected to be hired for construction and operation of the proposed project.

Mine Employment — Meridian expects to hire 23 employees for construction of the mine during the last two quarters of 1990 (Table 4.25). Construction should be completed by the end of the second quarter of 1991 with approximately 23 construction employees working during the first two quarters of that year. When mine production increases from 1.0 million to 2.1 million tons of coal in 1993, there would be additional construction activities. This construction phase would last one year and total construction employment should equal twelve persons (Table 4.25).

Mine operations should begin in late 1990, with an expected 71 full-time, mine-related employees working by the beginning of 1991 (Table 4.25). In 1993, 65 operations employees would be added during the first two quarters and an additional 63 employees would be hired in the last two quarters. By 1994, when full production should be attained, there would be approximately 199 persons working at the mine site.

As illustrated in Table 4.25, Meridian expects to hire 75 percent of the construction workers and two-thirds to three-fourths of the operations workers locally (Billings Job Service area). Most positions could be filled by local applicants who would be trained on site. Positions which would require special expertise, such as the underground supervisor and some technical employees, would most likely be recruited from outside the study area.

TABLE 4.24

TOTAL EMPLOYMENT SUMMARY — 3.0 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1996)

Employment	*1990*		*1991*				*1992*				*1993*				*1994*				*1995*				*1996*			
Category	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Construction Employees	35	35	29	23	26	26	26	26	26	26	38	38	25	25	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employees	0	30	87	87	87	87	94	94	94	94	171	171	234	234	207	207	207	207	207	207	207	207	207	207	207	207
Secondary	0	11	22	48	47	48	48	49	49	49	49	89	89	114	114	92	92	92	92	92	92	92	92	92	92	92
Total	35	76	138	158	160	161	168	169	169	169	258	298	348	373	321	299	299	299	299	299	299	299	299	299	299	299

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.
Meridian Minerals Company development estimates.

TABLE 4.25

MINE EMPLOYMENT — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Employment Category	1990		1991				1992				1993				1994				1995				1996			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Employment — Mine																										
Local Hire Ratio	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75
Administrative	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	2	2	2	2	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	8	8	8	8	0	0	0	0	0	0	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	6	6	6	6	0	0	0	0	0	0	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Operators	6	6	6	6	0	0	0	0	0	0	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Employment	23	23	23	23	0	0	0	0	0	0	12	12	12	12	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employment — Mine																										
Local Hire Ratio	.67	.67	.67	.67	.67	.67	.67	.67	.67	.67	.70	.70	.70	.70	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75
Administrative	0	5	11	11	11	11	11	11	11	11	20	20	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Technicians	0	5	13	13	13	13	13	13	13	13	23	23	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Mechanics	0	5	9	9	9	9	9	9	9	9	18	18	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Laborers	0	8	9	9	9	9	9	9	9	9	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Equipment Operators	0	7	29	29	29	29	29	29	29	29	57	57	83	83	83	83	83	83	83	83	83	83	83	83	83	83
Total Operations Employment	0	30	71	71	71	71	71	71	71	71	136	136	199	199	199	199	199	199	199	199	199	199	199	199	199	199
Total Mine Employment	23	53	94	94	71	71	71	71	71	71	148	148	211	211	199	199	199	199	199	199	199	199	199	199	199	199

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Meridian Minerals Company development estimates.

Loading Facility Employment — Meridian expects to hire twelve employees for construction of the loading facility during the last two quarters of 1990 (Table 4.26). Construction should be completed by the first quarter of 1991, when full operations have commenced. Further construction of a loading facility would occur during the last two quarters of 1993 to accommodate the new rail system to the mine site. Construction employment during this phase should total 13 employees.

For the first two years of operations, Meridian expects to hire four employees to operate the load-out facility. In 1993, an additional four employees would be hired, bringing total employment at the load-out facility to eight employees. Between 53 and 83 percent of the construction and operations loading facility employees are expected to be hired from the local work force area (Billings Job Service area).

Transportation Employment — Meridian expects to initially contract with or hire twelve employees during 1991 to transport the coal to the railroad siding at Huntley (Table 4.27). Following 1991, seven additional employees would be hired when production increases by 475,000 tons, and eight more employees would be hired in 1993 when production increases by 1.1 million tons.

Construction of the railroad would probably be accomplished by contracted construction firms (Bob Moorhead, personal communication, April 1989). Actual construction is expected to begin in mid-1991 and last for two years. Meridian expects that 26 employees would be involved in rail construction over the two-year period. By mid-1993, construction of the railroad should be complete and transportation of the coal by rail should commence. The transportation of the coal by rail would be increased over the last six months of 1993 so that, by 1994, truck transportation of coal should cease.

The number of truck drivers needed to transport the coal from the mine to the Huntley load-out facility was estimated by assuming the coal would be transported using 45-ton trucks. For example, in 1992 when 1.0 million tons of coal would be shipped, the transportation of the coal would require 22,222 trips per year. Based on a 260-day work year, approximately 85 round-trips would be made per work day, requiring 15 truck drivers. It is expected that most of the transportation employees would be hired locally (within the Billings Job Service area) since there is an adequate supply of persons experienced in transportation in both Musselshell County and Yellowstone County (Table 3.5).

Employment Distribution

The following sections describe the expected geographical distribution of the employees to be hired by Meridian for construction and operation of the mine.

Expected Local Hire Distribution — The distribution of workers hired locally was allocated to Roundup, rural Musselshell County, Billings, and rural Yellowstone County (primarily the area between Billings, Huntley, and the northern Yellowstone County border). The allocation of local hire was approximately

TABLE 4.26

LOADING FACILITY EMPLOYMENT — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Employment Category	1990		1991				1992				1993				1994				1995				1996			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Employment — Loading Facility																										
Local Hire Ratio	.83	.83	.83	.83	.83	.83	.83	.83	.83	.83	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70	.70
Administrative	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	1	1	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	6	6	3	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	2	2	1	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Operators	2	2	1	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Employment	12	12	6	0	0	0	0	0	0	0	0	0	13	13	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employment — Loading Facility																										
Local Hire Ratio	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
Administrative	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Technicians	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mechanics	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Laborers	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Equipment Operators	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total Operations Employment	0	0	4	4	4	4	4	4	4	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Total Loading Facility Employment	12	12	10	4	4	4	4	4	4	4	8	8	21	21	8	8	8	8	8	8	8	8	8	8	8	8

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989. Meridian Minerals Company development estimates.

70 percent for Billings, 20 percent for Roundup, and five percent each for rural Musselshell and Yellowstone counties. This allocation scheme was developed through interviews with personnel from the Billings Job Service Office and representatives of Meridian. The allocation is also similar to the distribution of new workers to the area estimated by using a gravity model (Gary Lythgoe, personal communication, March 1, 1989).

During the first year of operations (1991), Meridian expects to employ approximately 87 persons for mine operations (see Table 4.24) of which 59 would be hired from within the study area (Table 4.28). Of the 59 employees hired locally, 44 are expected to be from Billings, 11 from Roundup, and two each are expected to come from rural Musselshell and Yellowstone counties (Table 4.28). During full operations, the distribution of the 153 workers hired locally is expected to be approximately 109 from Billings, 30 from Roundup, and seven each from rural Musselshell and Yellowstone counties.

Expected In-migrating Workers Distribution — The distribution of expected in-migrating workers by general geographic area is illustrated in Table 4.29. The number and distribution of in-migrating workers was developed using company-supplied local hire ratios and the gravity model described in Appendix 12. The gravity model yielded the following distribution of mine workers to the area: 74 percent to Billings, 13 percent to Roundup, 6 percent to rural Musselshell County, and 7 percent to rural Yellowstone County. This distribution scheme indicates that, during full operations, 40 of the total of 54 in-migrating mine workers would live in Billings, seven in Roundup, three in rural Musselshell County, and four in rural Yellowstone County (Table 4.29).

Table 4.30 summarizes the expected final distribution of all mine-related workers including those that would be hired locally and those that would migrate into the area. During full operations, 149 of the mine related employees are expected to reside in Billings, 37 in Roundup, ten in rural Musselshell County, and eleven in rural Yellowstone County.

Secondary Employment

In addition to the projected employment created directly by mine operations and coal transportation, the project is expected to stimulate economic activity and employment in various trade and public service sectors of the study area. This new employment created indirectly as a result of the project is called "indirect or secondary" employment.

For rural areas, such as Roundup and rural county areas, an employment multiplier of 0.25 during construction and 0.4 during operations was found to be an average ratio of indirect to new direct employment (Gilmore, *et al.*, 1982). For more urban areas, such as the Billings area, an employment multiplier of 0.35 during construction and 0.5 during operations was found to be an average ratio of indirect to new direct employment. Based on these multipliers, should the mine operations and coal transportation create 207 direct jobs at full production, then approxi-

TABLE 4.27

TRANSPORTATION EMPLOYMENT — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Employment Category	1990		1991				1992				1993				1994				1995				1996			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Employment — Transportation																										
Local Hire Ratio	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
Administrative	0	0	0	0	3	3	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	0	0	0	0	3	3	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	0	0	0	0	8	8	8	8	8	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	0	0	0	0	6	6	6	6	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Operators	0	0	0	0	6	6	6	6	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Employment	0	0	0	0	26	26	26	26	26	26	26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operations Employment — Transportation																										
Local Hire Ratio	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90
Administrative	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Technicians	0	0	1	1	1	1	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Mechanics	0	0	1	1	1	1	1	1	1	1	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Laborers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Truck Drivers/Operators	0	0	9	9	9	9	15	15	15	15	22	22	22	22	0	0	0	0	0	0	0	0	0	0	0	0
Total Operations Employment	0	0	12	12	12	12	19	19	19	19	27	27	27	27	0	0	0	0	0	0	0	0	0	0	0	0
Total Transportation Employment	0	0	12	12	38	38	45	45	45	45	53	53	27	27	0	0	0	0	0	0	0	0	0	0	0	0

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989. Meridian Minerals Company development estimates.

TABLE 4.28

LOCAL HIRE DISTRIBUTION — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Type of Employment by Area	1990		1991				1992				1993				1994				1995				1996			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction																										
Roundup	5	5	4	3	4	4	4	4	4	4	6	6	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Billings	19	19	15	14	17	17	17	17	17	17	24	24	15	15	0	0	0	0	0	0	0	0	0	0	0	0
Rural Roundup	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Local Hire — Construction	26	26	21	17	23	23	23	23	23	23	32	32	18	18	0	0	0	0	0	0	0	0	0	0	0	0
Operations																										
Roundup	0	4	11	11	11	11	13	13	13	13	24	24	33	33	30	30	30	30	30	30	30	30	30	30	30	30
Billings	0	14	44	44	44	44	47	47	47	47	87	87	118	118	109	109	109	109	109	109	109	109	109	109	109	109
Rural Roundup	0	1	2	2	2	2	3	3	3	3	6	6	8	8	7	7	7	7	7	7	7	7	7	7	7	7
Rural Yellowstone	0	1	2	2	2	2	3	3	3	3	6	6	8	8	7	7	7	7	7	7	7	7	7	7	7	7
Total Local Hire — Operations	0	20	59	59	59	59	66	66	66	66	123	123	167	167	153	153	153	153	153	153	153	153	153	153	153	153
Total Local Hire Distribution																										
Roundup	5	9	15	14	15	15	17	17	17	17	30	30	36	36	30	30	30	30	30	30	30	30	30	30	30	30
Billings	19	33	59	58	61	61	64	64	64	64	111	111	133	133	109	109	109	109	109	109	109	109	109	109	109	109
Rural Roundup	1	2	3	2	3	3	4	4	4	4	7	7	8	8	7	7	7	7	7	7	7	7	7	7	7	7
Rural Yellowstone	1	2	3	2	3	3	4	4	4	4	7	7	8	8	7	7	7	7	7	7	7	7	7	7	7	7
Total Local Hire	26	46	80	76	82	82	89	89	89	89	15	155	185	185	153	153	153	153	153	153	153	153	153	153	153	153

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.29

IN-MIGRATING WORKER DISTRIBUTION — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Type of Employment by Area	1990		1991				1992				1993				1994				1995				1996			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction																										
Roundup	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Billings	6	6	6	5	3	3	3	3	3	3	5	5	6	6	0	0	0	0	0	0	0	0	0	0	0	0
Rural Musselshell	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total In-Migrating	9	9	8	6	3	3	3	3	3	3	6	6	7	7	0	0	0	0	0	0	0	0	0	0	0	0
Operations																										
Roundup	0	1	4	4	4	4	4	4	4	4	6	6	9	9	7	7	7	7	7	7	7	7	7	7	7	7
Billings	0	7	20	20	20	20	20	20	20	20	36	36	49	49	40	40	40	40	40	40	40	40	40	40	40	40
Rural Musselshell	0	1	2	2	2	2	2	2	2	2	36	3	4	4	3	3	3	3	3	3	3	3	3	3	3	3
Rural Yellowstone	0	1	2	2	2	2	2	2	2	2	3	3	5	5	4	4	4	4	4	4	4	4	4	4	4	4
Total Operations Settlement	0	10	28	28	28	28	28	28	28	28	48	48	67	67	54	54	54	54	54	54	54	54	54	54	54	54
Total Migration																										
Roundup	1	2	5	5	4	4	4	4	4	4	7	7	10	10	7	7	7	7	7	7	7	7	7	7	7	7
Billings	6	13	26	25	23	23	23	23	23	23	41	41	55	55	40	40	40	40	40	40	40	40	40	40	40	40
Rural Musselshell	1	2	2	2	2	2	2	2	2	2	3	3	4	4	3	3	3	3	3	3	3	3	3	3	3	3
Rural Yellowstone	1	2	3	2	2	2	2	2	2	2	3	3	5	5	4	4	4	4	4	4	4	4	4	4	4	4
Total Settlement	9	19	36	34	31	31	31	31	31	31	54	54	74	74	54	54	54	54	54	54	54	54	54	54	54	54

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.30

TOTAL MINE EMPLOYEE DISTRIBUTION — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Area	1990		1991				1992				1993				1994				1995				1996			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Roundup	6	11	20	19	19	19	21	21	21	21	37	37	46	46	37	37	37	37	37	37	37	37	37	37	37	37
Billings	25	46	85	83	84	84	87	87	87	87	152	152	188	188	149	149	149	149	149	149	149	149	149	149	149	149
Rural Musselshell	2	4	5	4	5	5	6	6	6	6	10	10	12	12	10	10	10	10	10	10	10	10	10	10	10	10
Rural Yellowstone	2	4	6	4	5	5	6	6	6	6	10	10	13	13	11	11	11	11	11	11	11	11	11	11	11	11
Total Settlement	35	65	116	110	113	113	120	120	120	120	209	209	259	259	207	207	207	207	207	207	207	207	207	207	207	207

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

mately 92 secondary jobs would also be created. Because secondary jobs typically do not require extensive training or specialized education, they probably would be filled by the local labor force. A local hire ratio of 90 percent was utilized to estimate expected secondary employment in-migration to the area.

During full operations, demand from direct employees of the mine is expected to create twelve new secondary jobs in Roundup, 74 new secondary jobs in Billings, and three secondary jobs in rural Yellowstone and Musselshell counties (Table 4.31). A total of eight secondary workers are expected to migrate into the study area due to the project. The remaining 84 secondary employees should all be hired from the local labor force.

Income

Income (payroll) from the mine and secondary jobs was estimated and is presented in Table 4.32. Projections of secondary income were derived by multiplying the number of secondary workers by an estimated weekly salary of $216. This salary is based on a statewide average of services related employees reported by the Montana Department of Labor and Industry.

Total wages and salaries from the project should be about $5.3 million during full operations. Approximately $4.3 million of this income would come directly from the mine, while $1.0 million would come from secondary jobs. Since many of the workers are expected to reside in the Billings area, the majority of this income would most likely be spent in Yellowstone County.

TABLE 4.31

TOTAL SECONDARY WORKER DISTRIBUTION — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

	1990		1991				1992				1993				1994				1995				1996			
Distribution	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
In-Migrating Distribution																										
Roundup	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Billings	0	1	2	4	3	4	4	4	4	4	4	7	7	9	9	7	7	7	7	7	7	7	7	7	7	7
Rural Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Yellowstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total In-Migrating	0	1	2	4	3	4	4	4	4	4	4	8	8	10	10	8	8	8	8	8	8	8	8	8	8	8
Local Hire Distribution																										
Roundup	0	1	2	6	6	6	6	6	6	6	6	10	10	14	14	11	11	11	11	11	11	11	11	11	11	11
Billings	0	9	18	36	36	36	36	37	37	37	37	65	65	82	82	67	67	67	67	67	67	67	67	67	67	67
Rural Musselshell	0	0	0	1	1	1	1	1	1	1	1	3	3	4	4	3	3	3	3	3	3	3	3	3	3	3
Rural Yellowstone	0	0	0	1	1	1	1	1	1	1	1	3	3	4	4	3	3	3	3	3	3	3	3	3	3	3
Total Local Hire	0	10	20	44	44	44	44	45	45	45	45	81	81	104	104	84	84	84	84	84	84	84	84	84	84	84
Total Secondary Distribution																										
Roundup	0	1	2	6	6	6	6	6	6	6	6	11	11	15	15	12	12	12	12	12	12	12	12	12	12	12
Billings	0	10	20	40	39	40	40	41	41	41	41	72	72	91	91	74	74	74	74	74	74	74	74	74	74	74
Rural Musselshell	0	0	0	1	1	1	1	1	1	1	1	3	3	4	4	3	3	3	3	3	3	3	3	3	3	3
Rural Yellowstone	0	0	0	1	1	1	1	1	1	1	1	3	3	4	4	3	3	3	3	3	3	3	3	3	3	3
Total Secondary Related Settlement	0	11	22	48	47	48	48	49	49	49	49	89	89	114	114	92	92	92	92	92	92	92	92	92	92	92

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.32

PAYROLL BY SOURCE — 3.0 MILLION TONS MINE PRODUCTION SCENARIO
(1990 TO 1996)

Type of Income	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*
Direct Income							
Mine	$395,00	$1,716,000	$1,477,000	$3,735,000	$4,140,000	$4,140,000	$4,140,000
Loading Facility	125,000	114,000	83,000	301,000	166,000	166,000	166,000
Transportation	0	250,000	395,000	832,000	0	0	0
Total Direct Income	$520,000	$2,080,000	$1,955,000	$4,868,000	$4,306,000	$4,306,000	$4,306,000
Indirect Income	$30,888	$463,320	$547,560	$957,528	$1,095,120	$1,033,344	$1,033,344
Total Income	$550,888	$2,543,320	$2,502,560	$5,825,528	$5,401,120	$5,339,344	$5,339,344
Annual Income Per Worker							
Direct Workers	$20,800	$18,407	$16,292	$20,803	$20,802	$20,802	$20,802
Indirect Workers	$11,232	$11,232	$11,232	$11,232	$11,232	$11,232	$11,232

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

Other income to the area would be from expenditures by the coal company for supplies and equipment and from the transportation contractor for equipment, fuel, repairs, and other supplies. Most of the mining equipment would be bought outside the study area. Since the trucking firm would be a contractor, it is not known where the firm would purchase their trucks or trailers. The expected local purchases (timber, lubricants, concrete blocks, roof batting supplies, safety equipment and other parts and supplies) by the mining company should average $3.4 million per year (Bob Morehead, personal communication, May 11, 1989).

Fiscal

Local Government Costs — The major cost to Musselshell County would be the maintenance of the Old Divide Road. The Old Divide Road is a two-lane road that may not sustain the type of traffic that is projected to occur under this mining scenario. The

State of Montana provides maintenance on the highways between the project site and the Huntley load-out facility. Thus, Yellowstone County should experience minor increased costs with respect to the road system in Yellowstone County. The increase in traffic may require additional services from both the sheriff's office and ambulance service providers; however, no new personnel or capital costs are anticipated.

Eleven new families (ten direct and one secondary) are projected to migrate into Musselshell County (see Demography impacts), which should add marginal administrative costs to the budget of Musselshell County. No new capital or personnel costs are anticipated for the county.

Fifty-one new families are projected to migrate into Yellowstone County (see Demography impacts), which would amount to approximately 150 people or about a 0.2 percent impact on the total population of the county. Marginal administrative costs to the county government budget are anticipated; however, no new capital or personnel costs are expected.

Eight new families (approximately 23 people) are projected to move into Roundup (see Demography impacts). This low number of in-migrating population should add marginal administration costs to the budget of the municipality of Roundup, but no new personnel or capital costs are anticipated. Forty-seven new families or approximately 138 new people are projected to move into Billings. This in-migration should amount to less than a 0.3 percent impact to the total population of the city. Marginal administrative costs are expected to the budget of Billings; however, no new capital or personnel costs are anticipated due to this increase in population.

Eight new students are expected to enroll in the Roundup School District. This small increase in mine-related enrollment should add marginal administrative and supply costs to the Roundup School District. No new capital or personnel costs are expected for the Roundup School District.

Thirty-six mine-related students (26 in kindergarten through grade 8 and ten in grades 9 through 12) are expected to enroll in the school system in Billings. If these new students are well dispersed within the school district, no new capital or personnel costs should be experienced by the Billings school districts. However, marginal administrative and supply costs may be added to the budget of the school districts in Billings.

State and Federal Government Costs — The major cost to Montana would be the increased maintenance of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) within the area. The life of the road also may be shortened due to the increased traffic (see Transportation impacts). However, to offset these impacts, indirect revenues would be generated through diesel fuel taxes, GVW fees, and Federal use fees paid by the trucking firm.

Federal costs from the land exchange would amount to forgone royalty payments (see leasing socioeconomics). Similar to Meridian, BLM administers Federal coal properties that checkerboard the Bull Mountains area. It is unknown whether other mining companies would be interested in leasing both Federal and private coal and paying royalties to both the Federal government and Meridian.

Local Government Revenues — During full operation Musselshell County government is expected to receive about $1.0 million in new taxes per year due to the project (Table 4.33). New revenues would be realized from taxes on gross proceeds of the coal and, to a lesser extent, property taxes on the mine, equipment and railroad.

By 1995, Yellowstone County government should receive about $214,831 in taxes that year from the mine project, including $152,880 in gross proceeds and approximately $62,000 from property taxation on the mine equipment and the railroad. In 1997, a shift in coal production to Yellowstone County would occur and, consequently, revenues should increase to about $454,859 per year (Table 4.33).

Revenues to the Roundup Elementary School District should average $400,000 to $600,000 annually during full operation of the mine (Table 4.33). Roundup High School District revenues are expected to average $300,000 to $400,000 annually due to the project. By 1997, revenues to the Yellowstone County School Districts should total approximately $750,000 per year due to taxation on the railroad, mine equipment, and the gross proceeds of coal mined in Yellowstone County. Appendix 13 gives an in-depth explanation of local government finances.

Minor local government revenues that are expected, but not listed in Table 4.33, are: school foundation program revenues for every new child enrolled in public schools, increased property valuation due to new home construction, and increased property valuation on new business or business expansion due to the in-migrating population. The net effect of the project on local governments within the area should be positive since, in most cases, revenues are expected to exceed expenditures. The primary reason for the positive financial outlook is due to the short duration of the construction period for the mine, thus the flow of revenues to local governments begins early in the project time frame.

State and Federal Government Revenues — During full production, the State of Montana should receive an estimated $2.6 million per year in additional revenues from taxes on the mine and payroll of the mine and secondary workers (Table 4.34). Federal revenues are expected to total about $2.9 million per year by full operations (Table 4.34). Other minor State and Federal revenues that are expected, but not listed in Table 4.34, include corporate taxes paid by the mining company and GVW and Federal use fees paid on the trucks (Appendix 13).

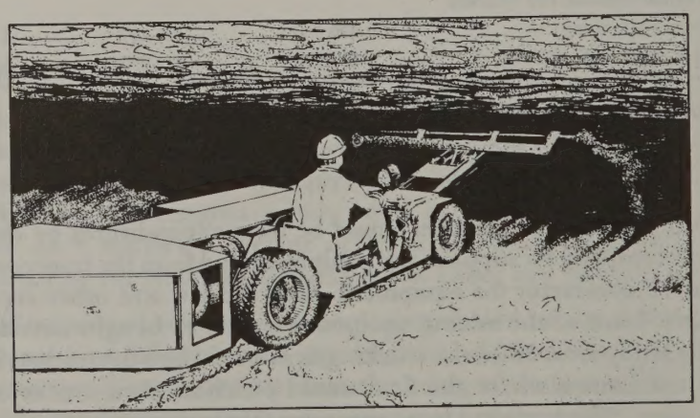


TABLE 4.33

PROJECTED LOCAL GOVERNMENT REVENUES — 3.0 MILLION TONS MINE PRODUCTION SCENARIO (1991 TO 1997)

Revenue Type	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Musselshell County Government							
Gross Proceeds	$132,276	$199,436	$529,396	$789,276	$743,140	$716,860	$565,896
Mine, Equipment, & Railroad	71,615	89,819	310,809	361,551	322,047	292,396	238,652
Total	$203,891	$289,255	$840,205	$1,150,827	$1,065,187	$1,009,256	$804,548
Roundup Elementary School							
Gross Proceeds	$70,615	$106,468	$282,616	$421,351	$396,722	$382,692	$302,101
Mine, Equipment, & Railroad	38,272	48,000	166,100	193,217	172,105	156,260	127,538
Total	$108,887	$154,468	$448,716	$614,568	$568,827	$538,952	$429,639
Roundup High School							
Gross Proceeds	$56,225	$84,772	$225,024	$335,489	$315,878	$304,708	$240,539
Mine, Equipment, & Railroad	30,473	38,219	132,252	153,843	137,034	124,417	101,548
Total	$86,698	$122,991	$357,276	$489,332	$452,912	$429,125	$342,087
Yellowstone County Government							
Gross Proceeds	$24,192	$106,512	$96,432	$99,792	$152,880	$183,120	$356,832
Mine, Equipment, & Railroad	12,782	37,214	51,045	51,012	61,951	64,691	98,027
Total	$36,974	$143,726	$147,477	$150,804	$214,831	$247,811	$454,859
Yellowstone County Schools							
Gross Proceeds	$40,032	$176,252	$159,572	$165,132	$252,980	$303,020	$590,472
Mine, Equipment, & Railroad	21,124	61,503	84,361	84,307	102,385	106,914	162,007
Total	$61,156	$237,755	$243,933	$249,439	$355,365	$409,934	$752,479

Note: 1) A major shift in coal production to Yellowstone County occurs in 1997.

2) Gross proceeds projected assuming $15 per ton coal. See Appendix 13 for assumptions relating to this table.

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

TABLE 4.34

PROJECTED STATE AND FEDERAL REVENUES — 3.0 MILLION TONS MINE PRODUCTION SCENARIO (1990 TO 1997)

Type of Revenues	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
State of Montana Revenues							
Coal Severance Tax	$275,214	$521,879	$1,100,869	$1,574,139	$1,572,085	$1,570,915	$1,564,194
RIT Tax	39,375	75,000	157,500	225,000	225,000	225,000	225,000
Individual Payroll	89,311	87,884	204,876	190,219	188,056	188,056	150,710
Diesel Fuel Taxes	37,333	71,111	74,667	0	0	0	0
Property Taxes (Schools)	109,765	218,101	447,738	629,251	636,486	637,982	660,948
Total	$550,998	$973,975	$1,985,650	$2,618,609	$2,621,627	$2,621,953	$2,600,852
Federal Revenues							
Individual Payroll	$234,760	$231,011	$538,532	$500,003	$494,320	$494,320	$396,152
Diesel Fuel Taxes	28,187	53,689	56,373	0	0	0	0
Abandoned Mine Tax	78,750	150,000	315,000	450,000	450,000	450,000	450,000
Black Lung Tax	346,500	660,000	1,386,000	1,980,000	1,980,000	1,980,000	1,980,000
Total	$688,197	$1,094,700	$2,295,905	$2,930,003	$2,924,320	$2,924,320	$2,826,152

Note: Gross proceeds projected assuming $15 per ton coal. See Appendix 13 for assumptions relating to this table.

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

Social Environment

Demography

The average family size of in-migrating workers depends not only on demographic characteristics of the workers (percent married with families, number of children present), but also on the particular phase of the mine development (construction or operations) at the time of in-migration. Several monitoring studies and surveys (Mountain West Research, 1975; Leholm, *et al.*, 1975; Wieland, *et al.*, 1977) indicate that in mineral and energy-related developments, the number of dependents accompanying the worker, and consequently the overall family size for in-migrating workers, is 20 to 30 percent less for construction than for operational workers. In a comparison of related worker characteristics for North Dakota mines, it was found that the family size for in-migrating construction workers

was 2.24 compared to 3.37 for in-migrating operational workers (Leholm, *et al.*, 1975). The primary reason for this smaller family size of construction workers is that many families of construction workers often do not accompany their spouse to the study area because of the short duration of construction. The construction workers either commutes to the project site or establishes a temporary residence in the study area during the construction phase and the family remains at the place of permanent residence.

Average family size of construction workers and secondary workers for this project were assumed to be 2.1, while family size for operations employees were assumed to be 3.1. Slightly larger family sizes (3.3) have been used in past environmental impact statements; however, these figures were based upon studies conducted in the middle and late 1970s, when family sizes were larger than currently being reported. Today's family sizes tend to be smaller because of the decline in fertility rates since the 1960s.

The number of school-aged children (children between the ages of 0 and 18 living at home) accompanying in-migrating workers was estimated using ratios developed based on 1987 Montana school statistics and on the estimated number of children 18 years old and younger living in the State during 1987. Based on this data, it is estimated that about 45 percent of the children 18 years old and younger are enrolled in grades kindergarten through 8, approximately 19 percent of the children are enrolled in high school, about 35 percent are not enrolled in school, and about one percent are ungraded or enrolled in special education.

The 3.0 million tons per year mine scenario would provide an estimated 25 and six jobs for Billings and Roundup residents, respectively, during the initial construction phase of the project. During full operations, it is expected that 149 workers would be from Billings, 37 from Roundup, and ten and eleven from the rural areas of Musselshell and Yellowstone counties, respectively. Although most jobs would be filled by the local available work force, some in-migration would occur (Appendix 14).

During peak construction, one mine-related worker is predicted to move into rural Musselshell County, one into the municipality of Roundup, and one worker is expected to move into rural Yellowstone County (Table 4.35). It is projected that no families would accompany the three in-migrating construction workers.

Six in-migrating construction workers are expected to move into Billings during peak construction. Three of the six workers are expected to be accompanied by their spouse. In addition, the three workers would bring a total of three children: one elementary-aged child, one high-school aged child, and one child not in school.

Three mine workers are expected to migrate to rural Musselshell County during full mine operations (Table 4.35). It is projected that two of the mine workers would be married with spouses present. Three children are expected to accompany the mine workers: one elementary-aged child, one high school-aged child, and one child not in school. During full operations, a total of 23 people would move to Roundup including seven mine workers, one secondary worker, six spouses, and nine children.

In rural Yellowstone County, twelve people are projected to move into the area during mine operations including four mine workers, three spouses, and five children. The largest influx of newcomers to the study area would be a total of 138 people moving to Billings (Table 4.35). Forty would be mine workers and seven would be secondary employees. Thirty-six spouses and 55 children would accompany the in-migrating workers.

Past monitoring studies found that mine workers were between 25 and 39 years of age (Mountain West Research-North, Inc. January 1983). However, because of the small number of newcomers (eight families) expected to move into Roundup, it is concluded that, under the 3.0 million tons per year scenario, there would be no significant demographic impacts on the community of Roundup. It is expected that the eight families ving into Roundup probably would not be unique in demographic characteristics from the existing residents. Similarly, the small number of in-migrating population expected to move into Billings probably would not be significantly different from the existing population and it is assumed that the 47 families would be dispersed throughout the city of Billings.

Social Life

Newcomers to the community would have little effect on the social life of Roundup. Past experiences of the community with cyclic resource developments (i.e., coal, oil, forest products, and agriculture) has imparted on the area a social history of boom and bust. Because of this cyclic growth pattern, many of the

TABLE 4.35

PROJECTED IN-MIGRATION TO THE STUDY AREA — 3.0 MILLION TONS MINE PRODUCTION SCENARIO

	Rural Musselshell County		*Roundup*		*Rural Yellowstone County*		*Billings*	
Expected In-Migration	*Peak Construction*	*Full Operations*	*Peak Construction*	*Full Operations*	*Peak Construction*	*Full Operations*	*Peak Contruction*	*Full Operations*
Mine-related Workers	1	3	1	7	1	4	6	40
Secondary Workers	0	0	0	1	0	0	0	7
Spouses	0	2	0	6	0	3	3	36
Children — Total	0	3	0	9	0	5	3	55
K-8	0	1	0	4	0	3	1	26
9-12	0	1	0	2	0	1	1	10
Not in School	0	1	0	3	0	1	1	19
Total	1	8	1	23	1	12	12	138

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

social processes and structures and the administrative and political experience necessary to deal with development already exist in Roundup.

The concept and reality of mining are respected and non-alien to the community. Social diversity in the Roundup area is relatively high due to the various social groups (i.e., ranchers, businesspeople, retired people, Bull Mountains residents) with differing life-styles, social experiences, and employment histories.

Extra-local linkages with Billings are already well developed and have provided an urban element to sociocultural awareness of the Roundup area residents. People seeking cultural aspects of a larger city, entertainment, or a wider selection of goods and services, would continue to travel to Billings for these amenities.

Positive impacts to the social well-being of Roundup area residents may be realized through increased job opportunities and local spending within the community. Those persons obtaining employment as a result of the project would gain the greatest benefits of social well-being. Mine and secondary workers as well as local merchants who were able to expand or stay in business as a result of increased spending within the community would benefit from the project.

Considering the history and experience of the Roundup area, it is unlikely that new coal miners and their families would represent a threat to the norms and values of the community. The relaxed, rural atmosphere of Roundup should be maintained since little population change is expected as a result of the project. Integration of newcomers should be relatively easy given the history of population influxes created by oil and gas activity. Informal interaction between long-time residents would continue, but interaction with newcomers may be more formal. Long-time residents, however, are accustomed to newcomers moving into the area.

Social life in the Roundup area would be affected by the project to the extent that many area residents have high expectations that the proposed project would revitalize the depressed economy of Musselshell County. Although the number of jobs and projected expenditures by the mining company are significant when compared to the Musselshell County economy, not all of the jobs would be filled by Musselshell County residents and only a portion of the income is expected to be spent in Musselshell County.

Social impacts also may occur because some area residents perceive that a land exchange may create a coal and transportation monopoly. Those who oppose the land exchange could be angry and upset because they perceive that the government may collaborate with industry to facilitate and expedite coal development.

Community Services

Similar to the 0.5 million tons per year mine scenario, coal truck traffic on the road may stress law enforcement patrolling, response to emergencies, and issuance of citations. Law enforcement personnel may have to be shifted from other parts of the county to adequately meet the demands created by the increased heavy truck traffic. After the railroad spur has been constructed, coal truck traffic on U.S. Highway 87 would cease; however, commuter traffic to the mine site would continue. Loss of coal truck traffic would alleviate the additional workload of the law enforcement officers.

Most community services would not be stressed by the predicted numbers of newcomers to Roundup. According to community service providers, more than 300 new people would have no impact on fire protection and more than 400 new residents would not exceed the capacity of the ambulance service. Sewer and water facilities are more than sufficient to accommodate the predicted number of newcomers that would in-migrate to Roundup.

According to Jay Erdie, Superintendent of Roundup School District (personal communication, February 24, 1989), 30 or more new students would exceed accreditation standards in grades 3, 4, 5, and 6. Two additional classrooms and 1.5 to 2.0 new full-time equivalents (teaching positions) would be required with 30 new students, assuming equal distribution throughout all grades. No additional staffing or classrooms would be required with as many as 45 new students in grades 7 and 8 and in the high school grades. As a result of this project, twelve mine-related new students (residing in both Roundup and rural Musselshell County) are predicted to enter the Roundup school system, which is well below the number that would require additional teachers and classrooms.

Law enforcement and the county road department currently are not adequately staffed. Traffic patrol, enforcement, and emergency services would be stressed by the transport of coal by trucks and the increase in commuter traffic. More traffic accidents are expected to occur on U.S. Highway 87 and U.S. Highway 312 (Huntley Road), while coal is being transported by truck to the railroad siding at Huntley. After the railroad spur is operational and coal truck traffic ceases, the impact on law enforcement and emergency services would be reduced.

The increase in commuter traffic would be limited to the start and the end of worker shifts. The demand placed on law enforcement officers during shift changes could cause patrol and enforcement responsibilities in other portions of the counties to be reduced or could necessitate the hiring of additional officers during the peak periods of commuter traffic. Residents experiencing reduced law enforcement protection from the project could view this community resource as not being equitably allocated. Ambulance services should be able to meet the demand for emergency services from increased traffic accidents.

In conclusion, community services in Roundup and Billings should be adequate to meet the demands of the projected number of newcomers in-migrating to the area. Law enforcement agencies probably would experience minor impacts as a result of the increased traffic, primarily during the time that coal is transported to the Huntley railroad siding.

Housing

Although rental housing is limited in the Roundup area, there is an adequate number of houses for sale to accommodate the projected number of in-migrants (seven families) to the Roundup area. Homeowners who have not been successful in the sale of their home may offer their homes for rent. In the Billings area, there is a sufficient number of rentals and homes for sale to accommodate the predicted number of in-migrating operations workers (40 families) under the 3.0 million tons per year mine scenario.

Transportation

Assumptions

The coal would initially be transported by 45-ton trucks from the mine site to Huntley, Montana, while the railroad spur to the mine site was under construction. The construction of the railroad would commence in 1991 and be completed by 1993. Production by the time the railroad is complete is expected to reach an annual rate of 1.2 million tons. Thus, transportation of the coal by truck would increase from 525,000 tons in 1991 to 1.0 million tons in 1992. In 1993, approximately 600,000 tons would be transported by truck in a six-month period (or an annual rate of 1.2 million tons).

The first year production level of 525,000 tons would require approximately 45 to 50 round-trips per day for 260 days per year assuming the coal was transported in 45-ton trucks (45 X 260 X 45 = 526,500). During the second year, 1.0 million tons per year would be transported by truck, requiring approximately 85 to 90 round-trips per day. With a production level of 1.0 million tons and a 16-hour work day for hauling, one truck would leave the mine site and the Huntley load-out facility every ten minutes (Table 4.36). For six months in 1993, the number of trips would reach 120 per day until construction of the railroad spur was complete.

In addition to the aforementioned truck traffic, there would be commuter and other minor hauling traffic (e.g., supplies, solid waste) associated with the project. Of the 207 full-time employees, 149 are expected to reside in or near Billings. Assuming 1.5 commuters per vehicle, this would imply that there would be an additional 99 round-trips per day in commuter traffic on U.S. Highway 87.

Traffic

The following discussion is based upon excerpts from letters from the Montana Department of Highways (Don Cromer, personal communication, March 1 and March 20, 1989).

TABLE 4.36

INTERVALS AT WHICH TRUCKS WOULD LEAVE THE MINE SITE AND LOADING FACILITY
3.0 MILLION TONS PRODUCTION SCENARIO

Annual Production Level	*Day Length of Hauling*			
	8 Hours	*12 Hours*	*16 Hours*	*24 Hours*
500,000	10 minutes	14 minutes	19 minutes	29 minutes
1,000,000	5 minutes	7 minutes	10 minutes	14 minutes
1,200,000	4 minutes	6 minutes	8 minutes	12 minutes

Note: Table assumes 45-ton trucks, 2-hour round-trip, and 260-day work year.

Source: Calculations based on U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989, and Meridian Minerals Company development estimates.

Capacity

In general, the roadway "capacity" is the estimated traffic-carrying capabilities of a roadway over a range of defined operational conditions. These operational conditions are defined by using the concept of "level-of-service". LOS for a particular section of roadway is a qualitative measure that describes operational conditions within a traffic stream and the perception of these conditions by motorists and/or passengers. Factors such as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety are general considerations involved in the LOS. The best service is designated as LOS"A", while the worst is designated as LOS"F" at which point traffic flow breaks down.

Current ratings of the proposed haulage route are "B" for U.S. Highway 87 (except for a two-mile stretch which is rated "C") and a high "C" rating for most of U.S. Highway 312 (Huntley Road). During the period when approximately 120 round-trips would be made daily, MDOH expects that four segments of the proposed haulage route would experience a reduction in their LOS rating due to increased truck traffic.

The locations where the level of service may be decreased are a 11.4-mile stretch of roadway on U.S. Highway 87 approximately 11.8 miles north of the junction of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) (from a "B" rating to a "C" rating); a 4.5-mile stretch of roadway on U.S. Highway 87 approximately 25.1 miles north of the U.S. Highway 87/U.S. Highway 312 junction (from a "B" rating to a "C" rating); and, during peak traffic periods, the intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) (from a current "C/D" rating to an "E/F" rating). The two segments of U.S. Highway 87 which are projected to decrease in LOS ratings are scheduled for reconstruction between 1991 and 1993 and, following reconstruction, the LOS rating of these roadways would be a "B" rating except between mile post 21.5 and 25.1 which would retain a LOS"C" rating under the projected transportation scenario.

The intersection of U.S. Highway 87 and U.S. Highway 312 (Huntley Road) is the most critical link in the haulage route for LOS considerations. The left turning movement through this intersection would take a long time to complete for the coal trucks and would severely restrict left turns from the southbound lane of U.S. Highway 87. This situation is a result of the high number of commercial vehicles turning left from a stop sign through a high volume of unstopped traffic moving west and east through the intersection from Billings and Huntley, respectively. Furthermore, because of the geometry of the intersection, it may be difficult for trucks of the proposed configuration to accomplish this maneuver. Analysis also indicates that the movement through the intersection cannot be improved by simply dedicating an outside southbound lane of U.S. Highway 87 to left turns only. Alternatives for improving the projected LOS rating of the intersection would be signalization of the intersection (at a cost of between $50,000 and $100,000) or selective scheduling through the intersection. Analysis indicates that selective scheduling for non-peak traffic periods could raise the LOS rating of the intersection from an "E/F" back to the current rating of "C/D" (Don Cromer, personal communication, March 20, 1989).

Safety

Traffic safety studies conducted by MDOH indicate that accident rates for large trucks are proportional to the mix of these vehicles in the traffic stream. This implies that the percentage of accidents involving large trucks as well as the overall accident rate on U.S. Highway 87 would increase as a result of the proposed transportation scenario. MDOH projects that the number of accidents involving large trucks may increase 70 percent from the proposed project.

Of special concern to MDOH are potential accident sites at the following intersections/segments:

(1) The angle of intersection between the Old Divide Road and U.S. Highway 87 is such that the drivers turning left from this road onto U.S. Highway 87 would have impaired visibility to the north.

(2) The intersection of U.S. Highway 87 with U.S. Highway 312 (Huntley Road-K-Mart corner) would experience increases in accidents from coal trucks making the left turn movement from U.S. Highway 87.

(3) The accident rate on U.S. Highway 312 (Huntley Road) would be worsened. Of special concern is the curve near the junction to Shepherd and the Shepherd junction itself. Both of these locations have a high potential for increased accident rates.

Roads and Bridges

The pavement conditions for the proposed haulage routes would deteriorate at an accelerated rate under the proposed transportation scenario. MDOH currently has three construction projects scheduled for U.S. Highway 87 between 1990 and 1993. The additional use attributable to the proposed coal haulage may necessitate the addition of either crushed base materials or plant mix to preserve the structural integrity of the roadway (Don Cromer, personal communication, March 1, 1989). Reconstruction projects on U.S. Highway 87 would require an additional 0.40 feet of crushed base course ($70,000 per mile) or an additional 0.15 feet of plant mix ($78,000 per mile) in order for U.S. Highway 87 to maintain its structural integrity. These quantities of additional base course and plant mix are based on the duration of hauling 120 round-trips per day not exceeding six months.

Annual maintenance costs would increase for all sections of the proposed haulage route from increased truck movement. In addition, the increased use probably would cause the failure of either of the roadways earlier than the projected designed life for the planned projects on U.S. Highway 87. The additional use may necessitate reconstruction of 7.5 miles of U.S. Highway 87 and overlaying ± 17.5 miles of roadway on or before year 2005. MDOH estimates that the proposed project would increase maintenance costs on U.S. Highway 87 by approximately $50,000 per year and that the maintenance costs on U.S. Highway 312 (Huntley Road) would increase by approximately $90,000 to $100,000 annually. To some extent, maintenance costs would be indirectly alleviated through diesel fuel taxes, Federal use fees, and GVW fees paid by the trucking firm.

Bridge structures on the proposed haulage route currently have sufficiency and load ratings that are adequate to accommodate the proposed coal haulage (Don Cromer, personal communication, March 1, 1989). However, narrow structures on U.S. Highway 312 (Huntley Road) may need to be reconstructed to improve safety.

School Bus Routes

There are currently eleven school bus routes that use the proposed transportation route. These buses are on the routes for approximately 1 1/2 hours in the morning and in the afternoon. In addition, some of the schools operate buses on the route on a different schedule one day a week.

Local school officials have expressed concern about the safety of school children on buses that operate on the same transportation route as the proposed coal haulage route (Jay Erdie, personal communication, March 13, 1989). These concerns are related to the frequent stops a school bus must make on a route and the safety of the children as they embark and disembark from the buses.

MDOH compared proposed traffic volumes on U.S. Highway 87 with other Montana highways near schools or on school bus routes. MDOH found that none of the other highways had accident clusters that specifically involved accidents associated with school activities or school bus transportation. However, the potential for increased traffic accidents involving school children would exist because of the increased traffic related to the proposed mine development (Don Cromer, personal communication, May 4, 1989).

Air Quality

Climate

The affect of the exchange will have no impact on the climate of the area. If the property is developed by a mining company for coal, the result will also have little or no effect on the climate of the area.

Air Quality

The overall affect of the exchange will have no impact of the air resources of the area. Possible plans by a mining company to open a 3.0 million tons per year mine were examined as to the effect on the air resources. The resulting air pollutant emissions from the mine are shown in Tables 4.37 through 4.39. The particulate emissions from the 3.0 million tons per year mine would be lower than expected due to the wet coal benefication process used. From the scenario analyzed, total suspended particulates and PM-10 particulates will have the maximum emissions. Total suspended particulate emissions are estimated to be 153.1 tons per year. PM-10 particulate emissions would be 75.2 tons per year. The maximum gaseous emissions will be nitrogen oxides, approximated to be 66.1 tons per year. In calculating the emission estimates, it was assumed that the mine would utilize the Best Available Control Technology as required by the Montana regulations.

The particulate emissions from the underground mine and processing facilities were simulated in an atmospheric dispersion model (Industrial Source Complex Model). The model calculated the worst case twenty-four hour concentrations of particulates using hypothetical meteorology. The model predicted a

TABLE 4.37

BULL MOUNTAINS MINE (3.0 Million TPY)
TOTAL SUSPENDED PARTICULATE EMISSIONS

Activity	*Uncontrolled Emissions (TPY)*	*Controlled Emissions (TPY)*
MINE AREA		
1. Mine Ventilation Exhaust	3.96	3.96
2. Dumping Run of Mine (ROM)	19.12	19.12
3. Conveying, Screening ROM	300.00	3.00
4. Primary Roll Crusher	25.00	0.25
5. Coal Storage	47.32	47.32
6. Load Coal For Transport	15.95	15.95
TRAIN LOADOUT		
1. Dump Coal At Loadout	15.95	15.95
2. Train Loadout	0.25	0.25
3. Coal Stockpile	47.32	47.32
TOTAL	474.87	153.12

Source: Gelhaus, James M., February 1989.

TABLE 4.38

BULL MOUNTAINS MINE (3.0 Million TPY)
PM-10 SUSPENDED PARTICULATE EMISSIONS

Activity	*Uncontrolled Emissions (TPY)*	*Controlled Emissions (TPY)*
MINE AREA		
1. Mine Ventilation Exhaust	3.96	3.96
2. Dumping Run of Mine (ROM)	9.18	9.18
3. Conveying, Screening ROM	108.00	1.08
4. Primary Roll Crusher	9.00	0.09
5. Coal Storage	22.72	22.72
6. Load Coal For Transport	7.68	7.68
TRAIN LOADOUT		
1. Dump Coal At Loadout	7.68	7.68
2. Train Loadout	0.12	0.12
3. Coal Stockpile	22.72	22.72
TOTAL	191.06	75.23

Source: Gelhaus, James M., February 1989.

TABLE 4.39

BULL MOUNTAINS MINE (3.0 Million TPY)
GASEOUS POLLUTANT EMISSIONS

Activity	*Sulfur Oxide TPY*	*Carbon Monoxide TPY*	*Hydrocarbons TPY*	*Nitrogen Oxides TPY*
Explosives	0.62	20.94	—	5.31
Diesel Fuel	6.63	26.24	4.44	60.80
TOTAL	7.25	47.18	4.44	66.11

Source: Gelhaus, James M., February 1989.

maximum twenty-four hour TSP concentration of 45.3 micrograms per cubic meter ($\mu g/m^3$) and the maximum twenty-four hour PM-10 concentration was 25.6 $\mu g/m^3$. The maximum twenty-four hour concentration around the train loadout area was 64.2 $\mu g/m^3$ for TSP and 36.1 $\mu g/m^3$ for PM-10. The Federal and Montana twenty-four hour PM-10 standard is 150 $\mu g/m^3$. No estimation was made of an annual average particulate concentration, due to the lack of available atmospheric data. However, since the maximum twenty-four hour TSP and PM-10 concentrations are well within the standards, it is assumed that the annual concentrations would also be within the standards. Generally, with fugitive dust as that occurring around mining operations, the more restrictive standards are the short-term (i.e., twenty-four hour) standards. As an example, the baseline maximum twenty-four hour TSP concentration was 107 $\mu g/m^3$, whereas the annual geometric mean was only 23.6 $\mu g/m^3$.

Therefore, the effect of the exchange, should an underground mine of the 3.0 million tons per year size stipulated in the analysis be built, would be that the particulate levels would increase above the present baseline. However, the air quality levels would still be well within the allowable concentrations under both Federal and Montana standards.

Agriculture

Even with subsidence there should be little or no effect on grazing. Vegetation distribution may change because of altered drainage patterns but grazing animals will not be significantly affected.

Cultural Resources

Longwall mining will create the greatest impacts to cultural resources. Subsidence from the longwall mine will damage or cause destruction to any rock art sites over the mining operations. Impacts to lithic scatter sites can be expected from soil displacement and expansion at subsidence margins (Robert Bohman, personal communication, June 30, 1989). Disturbance to standing wooden aboriginal and historic structures could be expected if these structures have not already been destroyed by the Hawk Creek wildfire.

Topography and Soils

Topography will be impacted primarily from the subsidence. Over a large area, the subsidence will not be readily noticeable to the topography. Soils will be impacted from the subsidence to a limited extent primarily by slope failure, altered drainage patterns and surface fissures which alter the soil structure, infiltration rates and permeability as a result of mixing of soil horizons.

Vegetation

The type of vegetation would not be altered but the distribution may be changed because of altered drainage patterns.

Wildlife

There is very little published data available regarding surface wildlife habitat impacts from longwall underground coal mining

in the western U.S. An operation in Utah that involved a coal seam very similar in thickness to the Bull Mountains deposits experienced subsidence to a degree that equaled the thickness of the mined coal seam. There were in this case, however, no apparent adverse changes in habitat quality or wildlife use in the area (Pat Farmer, personal communication, January 1989).

There will be a certain amount of wildlife displacement associated with mine-mouth activities. There will also be some disturbance to local wildlife populations associated with haul-road activities. Overall, wildlife impacts from the mine are expected to be insignificant.

Hydrology

Generally, all impacts associated with the 0.5 million tons per year room and pillar mine would also affect the mined areas of the 3.0 million tons per year longwall mine.

The area of impact is the same as the 0.5 million tons per year mine with the inclusion of T6N.,R27E., Sections 16 through 21. Except for its southeast corner, Federal Section 18 is not included, having overburden depths greater than 200 feet over much of its extent.

Subsidence associated with longwall extraction of coal where overburden depths range from 200 to 400 feet may result in minor impact at the surface, especially where the overburden section lacks massive sands within 100 feet of the coal seam. Most of this impact would be confined to lower portions of the Redher Creek drainages overlying the areas to be mined, and consist of near-surface crack development and associated limited subsidence that could temporarily affect groundwater flow within alluvial channels. Such effects may be either positive or negative depending upon the magnitude and location of subsidence. It is conceievable that alluvial groundwater conditions could become enhanced by the development of local retention basins. On the other hand, fracturing may result in greater infiltration of surface runoff or may cause some leakage of shallow alluvial or perched overburden groundwater into the deeper aquifer system where the overburden thickness is less than 400 feet. This appears unlikely however, due to the presence of extensive shaley horizons which are not inclined to fail in brittle fashion and because wholesale subsidence as a coherrent block is unlikely under conditions that favor caving of the overburden directly overlying the coal bed being mined. Trough subsidence, if it occurs, also favors compressional healing of mean average surface fractures at moderate depths.

Except for springs directly associated with alluvial channel fill, there should be no detrimental effects on springs in the expanded mine areas. They tend to occur where overburden thicknesses are greater than 400 feet, thus no subsidence impact appears probable. Where overburden thicknesses are less, primarily along Rehder Creek, surface cracking may either result in the development of new springs, create increased flow in existing springs, or temporarily shutdown existing spring flow. It is doub watering purposes would be affected over the long term, especially t the overall availability of springs for stocksince groundwaters associated with overburden materials define a potentiometric surface (Map 11) that strongly suggests recharge from direct infiltration into clinker beds in the Dunn Mountain area immediatly east of and adjacent to the area to be mined.

No wells have been identified directly within the area to be mined and most nearby stock wells have been abandoned. Thus, it does not appear that coal extraction will have any direct impact on local use of the deep aquifer system. However, the expanded areas to be mined are locales where the water table of the deep aquifer system lies above the Mammoth coal seam, thus temporary dewatering over an extensive area may steepen the groundwater gradient and subsequently cause some temporary lowering of static water levels in upgradient domestic wells on the southwest edge of the Bull Mountains. Within a few years, the system would recover.

Fracturing and caving directly above the coal seam, associated with longwall subsidence equal to 70 percent of the coal seam thickness, has potential for increasing permeabilities associated with portions of the deep aquifer. This is a positive effect that could lead to flow improvement and enhanced groundwater recharge of the deep aquifer and to increased groundwater storage for future use throughout the Bull Mountains basin.

Recreation

Most recreational activities or opportunities will remain about the same except for hunting. With the increase in man's activity, it is anticipated that some wildlife species will move out of the area thus hunting opportunities will decrease. A minor reduction in wildlife habitat is also expected to occur, thus reducing wildlife populations and hunting opportunities somewhat. Other types of dispersed recreational opportunities will be affected minimally — mostly in the area of the proposed surface facilities. Overall, recreational impacts would be insignificant and limited by the large amount of private ownership of the surface lands.

Stratigraphy and Geology

Approximately 80 percent of the Mammoth coal bed will be removed.

Subsidence

Subsidence will definitely occur as a result of longwall mining. The surface expression takes the form of broad troughs for single panels; however, over the entire mine area there is a lowering of the surface elevation by approximately seven feet. Overall, the landscape characteristics will exhibit little disruption. Appendix 5 contains an in-depth discussion of the predictions of subsidence.

OFFERED PRIVATE LANDS

Priority Lands Nos.1,2,3 — Madison County (697.45 acres)

PROPOSED MANAGEMENT

All parcels would be managed to provide high quality bank fishing or float fishing, and other dispersed recreational activities along the river. This is in accordance with existing MFP guidelines which call for no tree cutting, road building or mineral activities on public lands within the immediate river corridor. No recreation development is anticipated for these parcels in the near future.

Resource Impacts

The exchange of the private lands into Federal ownership will have minimal or no impacts to the following resources:

Transportation
Air Quality
Areas of Critical Environmental Concern
Threatened and Endangered Species
Hazardous Wastes
Wild and Scenic Rivers
Wilderness
Topography and Soils
Hydrology
Stratigraphy and Geology

The following resources will be impacted by the exchange of these lands into Federal ownership.

Socioeconomics

The proposed land exchange would remove 697.45 acres from the property tax base of Madison County and would add the same amount of acreage to the public domain under BLM holdings. At the present time, BLM manages 253,509 acres in Madison County; therefore, the land exchange would impact total landholdings less than 0.3 percent.

Madison County (including school districts) would lose approximately $124.15 per year in property tax revenues from the exchange. Increased revenues for Madison County would be from payment in lieu of taxes (PILT) and from grazing fee payments under the Taylor Grazing Act (Appendix 15 contains an explanation of PILT payments). In FY 1988, Madison County received $217,956 in PILT payments. The additional acreage resulting from the land exchange should add $523.09 to the Madison County PILT Entitlement (the FY 1988 ceiling was $282,000). Grazing fees from the additional acreage are expected to total $217.62 of which 12.5 to 50.0 percent would be returned to the county. The overall effect of the land exchange upon revenues of Madison County and the local school districts are not considered to be significant.

The local economy should benefit directly from expenditures from increased recreational visitor days attributable to the proposed land exchange. BLM estimates that there would be 1,242 angler days and 100 dispersed recreational days on these properties due to the land exchange in Madison County (Bruce Botsford, personal communication, March 3, 1989). Recent studies by the Montana Department of Fish, Wildlife and Parks (August 1987) indicate that resident fishermen spend, on the average, approximately $22.31 per day in out-of-pocket costs for stream fishing. This would indicate that the local economy may benefit from $27,709 in annual expenditures due to the land exchange, assuming that the participants would not be spending income in other endeavors, should they choose not to go fishing.

The total recreational benefit to the public should increase as a result of the proposed exchange. In terms of net economic value as measured by willingness to pay, the estimated total public recreational benefit could increase by $127,484 based upon $102 per angler day and an estimate of 1,242 angler days and $8 per dispersed recreation day and an estimate of 100 recreation days on these properties (Bruce Botsford, personal communication, March 3, 1989). As a comparison, the total public recreational benefit of fishing on the Madison River was estimated to be $22.2 million based on 108,712 angler days (Montana Department of Fish, Wildlife and Parks, August 1987).

No significant impacts would be realized on the social life or community services in Madison County as a result of the land exchange, primarily because no in- or out-migration would accompany the exchange. There may be an increase in dispersed recreation; however, the effect would be minimal upon the area population.

The exchange from private to public land would have a positive effect on the social well-being of those who engage in dispersed recreational activities (e.g., fishing, hunting, horseback riding, wildlife viewing) by satisfying local and regional demand for recreational use and access. Conversely, adverse impacts on the social well-being of landowners adjacent to the public land and of landowners who lease the land for livestock grazing may occur if conflicts concerning land use practices (e.g., gates left open, driving across unroaded rangeland, accidential fires, camping on private lands) arise between recreationists and ranchers.

Cultural Resources

Management of cultural properties by BLM within the selected priority lands will have a beneficial effect. If and when disturbance to areas in such lands is proposed, inventory of disturbance areas, evaluation under the criteria set for nomination to the National Register of Historic Places, and allocation of cultural resource use designation will take place. Any adverse impact will be mitigated and cultural properties will be preserved and protected.

Agriculture

Grazing is expected to continue, although stocking rates may be adjusted to accommodate riparian habitat management goals and to improve range condition if necessary.

Floodplains

No subdivision development will be allowed on these areas.

Native American Religious Concerns

The proposed action will have no adverse effects and may have possible beneficial effects on Native American Religious con-

cerns since any potential sites within the affected lands will be brought under Federal protection under the American Indian Religious Freedom Act.

Wetland/Riparian Zones

These lands will be managed to improve the riparian vegetation. Improved management would enhance the vigor and diversity of woody riparian species to the benefit of most wildlife species.

Vegetation/Grazing

Grazing will be continued, but will be managed to improve the riparian zone and range condition.

Wildlife

Improvement of the riparian zone will enhance the wildlife habitat.

Other Minerals

Oil/Gas

Although Meridian Minerals will retain the oil and gas rights on these properties, BLM will be afforded surface property owner rights prior to any oil and gas development.

Mineral Materials/Mining Claims

No mineral material sales would be allowed in accordance with the Dillon MFP. These lands have very low mineral values. Consequently no mineral development is envisioned. If mining claims are filed, mineral development would be managed under existing procedures, laws and regulations.

Recreation

Acquisition of the tracts will provide legal access to the Madison River and will be managed for recreation. As recreational use of the river increases, these lands will provide opportunities to disperse that use and allow for more intensive management of the recreational use on the river.

Priority Lands No.4 — Custer County (640 acres)

PROPOSED MANAGEMENT

Acquisition of this offered tract would bring a majority of the Snow Creek drainage under BLM management. The lands would be incorporated into and managed under a grazing allotment management plan. An exchange for the adjacent State section is also under preliminary consideration. If both sections are ultimately acquired, benefits to both public lands management and recreational use will accrue. The BLM would be afforded range management opportunities, such as stockwater pipelines or reservoirs, that could be designed through more than one allotment along a common drainage. Recreational opportunities, primarily deer hunting, are enhanced by allowing the public use of the entire drainage.

As the public becomes more aware of the adjusted land pattern of this area, it can be assumed that increased recreational use will occur. This may lead to a need for increased management control of the area to offset the impacts. However, such impacts would not be unique to this specific locale, and would be paralleled statewide as scattered tracts are exchanged into contiguous blocks. The outcome will result in the BLM taking a more active role in recreation management.

Custer County's tax base would also be affected slightly by acquisition of the parcel. The overall tax base of the county would be decreased by 640 acres. This would be replaced, in part, by Payment in Lieu of Taxes. Actual impacts of tax adjustments are discussed in the socioeconomics section of this document.

RESOURCE IMPACTS

The exchange of these private lands into Federal ownership will have minimal or no impact to the following resources:

Transporation
Air Quality
Areas of Critical Environmental Concern
Floodplains
Threatened and Endangered Species
Hazardous Wastes
Wild and Scenic Rivers
Wilderness
Vegetation
Stratigraphy and Geology

The following resources will be impacted by the exchange of these lands into Federal ownership.

Socioeconomics

The proposed land exchange would remove 640 acres from the property tax base of Custer County and would add the same amount of acreage to the public domain under BLM holdings. At the present time, BLM manages 339,684 acres in Custer County; therefore, the land exchange would impact total landholdings less than 0.2 percent.

Custer County (including school districts) would lose approximately $164.58 per year in property tax revenues from the exchange. Increased revenues for Custer County would be from PILT and from grazing fee payments under the Taylor Grazing Act (Appendix 15 contains an explanation of PILT payments). In FY 1988, Custer County received $241,057 in PILT payments. The additional acreage resulting from the land exchange should add $480.00 to the Custer County PILT Entitlement (the FY 1988 ceiling was $416,000). Grazing fees from the additional acreage are expected to total $223.20 of which 12.5 to 50.0 percent would be returned to the county. The overall effect of the land exchange upon revenues of Custer County and the local school districts are not considered to be significant.

The local economy should benefit directly from expenditures from increased recreational days attributable to the proposed land exchange. BLM estimates that there would be 30 hunting days (mostly deer) on these properties from the land exchange in Custer County (Dale Tribby, personal communication, March

3, 1989). Recent studies by the Montana Department of Fish, Wildlife and Parks (August 1987) indicate that resident deer hunters spend, on the average, $31.11 in out-of-pocket costs per day to hunt deer. This would indicate that the local economy may benefit from $933 in annual expenditures due to the land exchange, assuming that the hunters would not be spending income in other endeavors, should they choose not to go hunting.

The total recreational benefit to the public should increase as a result of the proposed exchange. In terms of net economic value as measured by willingness to pay, the estimated total public recreational benefit could increase by $1,650 based upon $55 per hunter day and an estimate of 30 hunting days on these properties (Dale Tribby, personal communication, March 3, 1989). As a comparison, the total public recreational benefit of deer hunting in southeastern Montana was estimated to be $25.5 million based on 65,587 hunter days (Montana Department of Fish, Wildlife and Parks, August 1987).

No significant impacts would be realized on the social life or community services in Custer County as a result of the land exchange, primarily because no in- or out-migration would accompany the exchange. There may be an increase in dispersed recreation; however, the effect would be minimal upon the area population.

The exchange from private to public land would have a positive effect on the social well-being of those who engage in dispersed recreational activities (e.g., fishing, hunting, horseback riding, wildlife viewing) by satisfying local and regional demand for recreational use and access. Conversely, adverse impacts on the social well-being of landowners adjacent to the public land and of landowners who lease the land for livestock grazing may occur if conflicts concerning land use practices (e.g., gates left open, driving across unroaded rangeland, accidental fires, camping on private lands) arise between recreationists and ranchers.

Cultural Resources

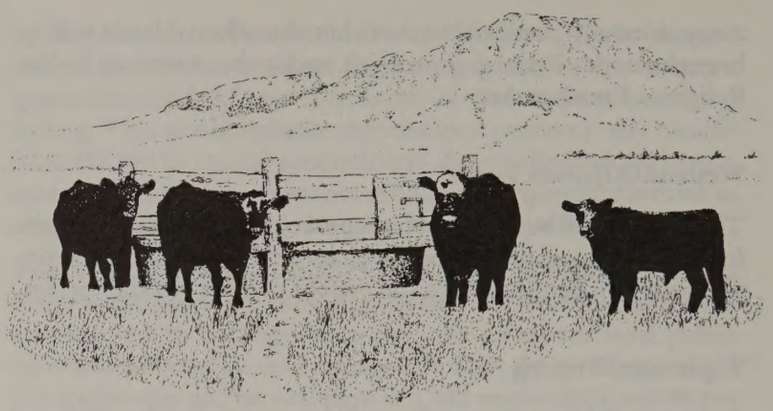
Management of cultural properties by BLM within the selected priority lands will have a beneficial effect. If and when disturbance to areas in such lands is proposed, inventory of disturbance areas, evaluation under the criteria set for nomination to the National Register of Historic Places, and allocation of cultural resource use designation will take place. Any adverse impact will be mitigated and cultural properties will be preserved and protected.

Agriculture (Farm and Grazing)

Should the parcel be acquired by BLM, it will continue to be leased by Harding Land and Cattle Company. Impacts to the lessee will be in the form of a reduced rental for grazing, since BLM's fees are lower. Also, there will be greater flexibility in range improvements and design because of the consolidation of public lands in the area.

Native American Religious Concerns

The proposed action will have no adverse effects and may have possible beneficial effects on Native American Religious Concerns, since any potential sites within the affected lands will be brought under Federal protection under the American Indian Religious Freedom Act.



Wetland/Riparian Zones

Approximately 3/4 of a mile of Snow Creek will be acquired through the proposed action. Once acquired the affected lands along the creek would be inventoried for inclusion and management under the Big Dry Resource Area's riparian management plan.

Topography and Soils

As a result of this exchange, there may be opportunities for management activities that may result in improved soil and vegetative productivity and overall watershed condition. Improved vegetative conditions and cover could be expected resulting in an improvement in soil stability and a decrease in sheet and rill erosion. This improvement will also result in a decrease in the sedimentation rate in the drainages. No impacts to the overall topography are anticipated.

Wildlife

Wildlife populations will be impacted by the increased recreation use of this parcel. There may also be opportunities for habitat management projects to benefit wildlife.

Other Minerals

Oil/Gas

Although Meridian Minerals will retain the oil and gas rights on these properties, BLM will be afforded surface property owner rights prior to any oil and gas development.

Mineral Materials/Mining Claims

Mineral material sales and minerals management would be allowed and managed under existing laws, procedures and regulations. The potential for mineral development is low.

Hydrology

Overall, the change in ownership should have a beneficial effect in the watershed condition on the allotment. The areas were used for livestock grazing before the exchange and this use will

continue after the exchange, therefore, little change is expected. With BLM's emphasis on management of riparian areas, there should be a slight increase in the watershed condition along Snow Creek.

Recreation

A major concern involving BLM lands in eastern Montana is the lack of public access and scattered BLM ownership. Acquisition of this tract would further block up a high use recreation area and help alleviate landowner/sportsmen conflicts. It would also increase other recreational activities such as camping, bird watching, ORV use, rock collecting, trapping and photography.

Priority Lands No.5 — Beaverhead/Deer Lodge County (1475.48 acres)

PROPOSED MANAGEMENT

These lands will be managed to protect and enhance their outstanding wildlife and recreational values in accordance with the Upper Big Hole River Management Plan. Dispersed recreation would be encouraged. No major developed recreation sites are planned at this time. Public access to 10,000 acres of public and National Forest lands would be preserved. Grazing use would be adjusted to allow recovery of the significant riparian resource on these lands.

RESOURCE IMPACTS

The exchange of Private lands into Federal ownership will have minimal or no impacts to the following resources:

Air Quality
Areas of Critical Environmental Concern
Hazardous Waste
Wilderness
Stratigraphy and Geology

The exchange of these lands into Federal ownership will impact the following resources.

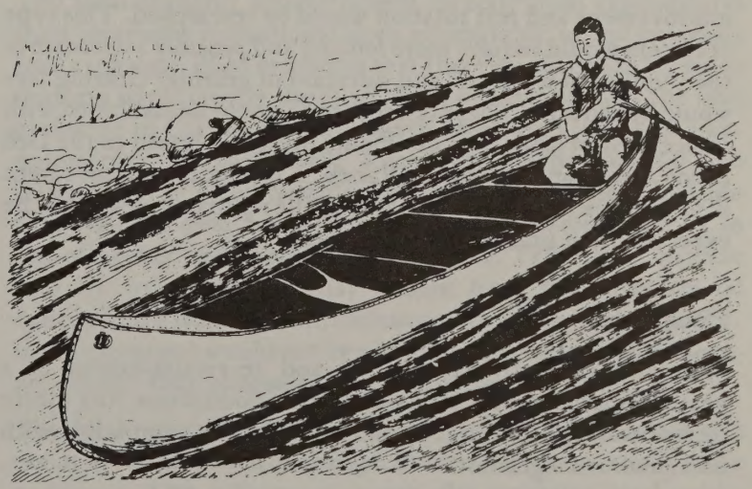
Socioeconomics

The proposed land exchange would remove 1,297.92 acres from the property tax base of Beaverhead County and 177.56 acres from the tax base of Anaconda-Deer Lodge County, but would add the same amount of acreage to the public domain under BLM holdings. At the present time, BLM manages 662,530 acres in Beaverhead County and 5,360 acres in Anaconda-Deer Lodge County; therefore, the land exchange would impact total public landholdings in Beaverhead County by less than 0.2 percent and landholdings in Anaconda-Deer Lodge County by approximately 3.3 percent.

Beaverhead County (including school districts) would lose approximately $376.40 per year in property tax revenues from the exchange, while Anaconda-Deer Lodge County would lose approximately $24.52 in property tax revenues annually. Increased revenues for Beaverhead and Anaconda-Deer Lodge counties would be from PILT payments and from grazing fee payments under the Taylor Grazing Act (Appendix 15 contains an explanation of PILT payments). In FY 1988, Beaverhead County received $226,353 in PILT payments and Anaconda-Deer Lodge County received $123,978 (the FY 1988 ceiling for Beaverhead County was $342,000 and for Anaconda-Deer Lodge County the ceiling was $374,000). The additional acreage resulting from the land exchange should add $973.41 to the Beaverhead County PILT Entitlement and $133.17 to the Anaconda-Deer Lodge PILT Entitlement. Grazing fees from the additional acreage are expected to total $358.98 for Beaverhead County and $37.20 for Anaconda-Deer Lodge Counties, of which 12.5 to 50.0 percent would be returned to the counties. The overall effect of the land exchange upon revenues of the counties and the local school districts are not considered to be significant.

The local economy should benefit directly from expenditures due to increased recreational visitor days attributable to the proposed land exchange. BLM estimates that there would be 500 angler days and 100 elk hunting days from the land exchange on these properties in Beaverhead and Anaconda-Deer Lodge counties (Bob Rodman, personal communication, March 3, 1989). Recent studies by the Montana Department of Fish, Wildlife and Parks (August 1987, February 1988) indicate that resident fishermen spend $22.31 per day and resident hunters spend $28.57 per day in out-of-pocket costs. This would indicate that the local economy may benefit from $14,012 in annual expenditures from the land exchange, assuming that the participants would not be spending income in other endeavors, should they choose not to go stream fishing or hunting.

The total recreational benefit to the public could increase as a result of the proposed exchange. In terms of net economic value as measured by willingness to pay, the estimated total public recreational benefit could increase by $57,600 based upon $102 per angler day and an estimate of 500 angler days and $66 per elk hunting day and an estimate of 100 elk hunter days on these properties (Bob Rodman, personal communication, March 3, 1989). As a comparison, the total public recreational benefit of fishing on the Big Hole River was estimated to be $6.8 million based on 47,910 angler days (Montana Department of Fish, Wildlife and Parks, August 1987). The total recreational benefit of elk hunting in the Pioneer Mountains area was estimated to be $2.9 million based on 39,824 elk hunter days (Montana Department of Fish, Wildlife and Parks, February 1988).



No significant impacts would be realized on the social life or community services in Beaverhead or Anaconda-Deer Lodge counties as a result of the land exchange, primarily because no in- or out-migration would accompany the exchange. There may be an increase in dispersed recreation; however, the effect would be minimal upon the area population.

The exchange from private to public land would have a positive effect on the social well-being of those who engage in dispersed recreational activities (e.g., fishing, hunting, horseback riding, wildlife viewing) by satisfying local and regional demand for recreation use and access. Conversely, adverse impacts on the social well-being of landowners adjacent to the public land and of landowners who lease the land for livestock grazing may occur if conflicts concerning land use practices (e.g., gates left open, driving across unroaded rangeland, accidental fires, camping on private lands) arise between recreationists and ranchers.

Transportation (Access)

Acquisition of these tracts with the exception of Section 9, NW¼NW¼ will ensure long-term public access both within these immediate tracts as well as the adjacent Beaverhead National Forest land in the Pioneer Mountains. Motorized vehicle access within these lands west of the river will be limited to designated routes while the long-term use of the Sawlog Creek Road with its undeveloped river crossing will be decided through a forthcoming travel plan and will be coordinated with the public through the Southwest Montana Interagency Travel Plan and Map.

Cultural Resources

Management of cultural properties by BLM within the selected priority lands will have a beneficial effect. If and when disturbance to areas in such lands is proposed, inventory of disturbance areas, evaluation under the criteria set for nomination to the National Register of Historic Places, and allocation of cultural resource use designation will take place. Any adverse impact will be mitigated and cultural properties will be preserved and protected.

Agriculture (Grazing)

Under BLM management, a grazing system considering riparian improvement and rest rotation would be researched. This type of system would require more fencing and possibly a decrease in the number of livestock and duration of grazing. Grazing fees would be reduced. These offered lands would be combined with adjacent BLM lands into allotments presently leased to the Dell Bacon Ranch and Ray Bacon Ranch. A significant improvement in vegetative condition, primarily in the riparian zones, could be expected from grazing management.

Floodplains

Improved vegetative conditions and re-establishment of a healthy riparian zone would stabilize the floodplains. Any future recreational or access developments would be compatible with floodplain management.

Native American Religious Concerns

The proposed exchange will have no adverse effects and may have possible beneficial effects on Native American Religious Concerns, since any potential sites will be brought under Federal protection under the American Indian Religious Freedom Act.

Threatened and Endangered Species

Potential habitat would be protected. Any trees used by bald eagles for roosting or foraging would be protected.

Wetland/Riparian Zones

Any future grazing management system would be designed to allow full recovery of the riparian zones. This will result in a significant improvement of the important riparian areas present on these lands. One and one-half miles of the Big Hole River's banks would be restored to a healthy riparian community.

Wild and Scenic Rivers

Public ownership would be valuable for any potential future designations, but no such designations are expected.

Topography and Soils

Improved vegetative conditions would maintain soil stability and end current erosion of the riverbanks. The potential erosion and siltation from a major timber harvest would be avoided.

Vegetation

Improved management would allow a significant improvement in grassland and riparian communities. Of greatest importance would be the restoration of healthy riparian vegetation along the riverbanks and adjacent bottomlands. A major resurgence of brushy riparian species could be expected, especially willow species. Active vegetation management, including an improved grazing system and potential prescribed burns would increase available forage for big game.

Acquisition of these lands would result in the acquisition of 475 acres of forested land. This action would improve the public forest management situation on the south side of the Big Hole River for several miles by improving access and blocking up public ownership and forest lands. The amount of forested area involved is too small to have any significant effect overall on forest management or annual timber harvests in the Headwaters Resource Area. With the existing timber types and road situation, it is unlikely that the BLM would do any timber harvesting in this area other than post and pole thinning in the current planning cycle.

Wildlife

The high wildlife values would be protected and could be significantly improved under public ownership. Disruption from extensive timber harvest or development of private hunting lodges would be avoided. Conflicts with livestock grazing would be minimized.

Security cover for elk and deer would be retained and available forage could increase. Habitat and forage for moose would significantly increase with improved riparian management. Black bear habitat would be protected.

Waterfowl habitat would improve, although opportunities are limited. Goose brooding habitat could be enhanced with proper grazing management. Duck nesting habitat will improve considerably with restoration of floodplain vegetation.

Fisheries values on these tracts will be enhanced by restoration of riparian vegetation. This will stabilize the riverbanks and provide adequate cover. This will especially benefit the arctic grayling by minimizing summer thermal problems along nearly 1.5 miles of river.

Several stream drainages within the tracts show signs of historic beaver activity. In most cases, or possibly all cases, there is no current beaver activity. Reintroduction of beaver to some of these sites could enhance riparian and wildlife values.

Other Minerals

Meridian Minerals will retain the oil and gas rights. BLM will be afforded surface property owner rights prior to any oil and gas development. Mineral material sales and minerals management will be allowed and managed under existing laws and regulations. BLM management will improve the probability that any future development will be compatible with other resource values.

Hydrology

Acquisition of these tracts alone cannot control the hydrology of a major river system like the Big Hole or even Sawlog Creek which originates on National Forest lands. However, proper management would stop bank erosion along the 1.5 miles on these tracts, and the return of riparian vegetation could allow for less heating of the river during summer months and help improve water quality.

Recreation

Existing public recreational use would be protected. Increased use could be expected once the area is identified as public land. Proper management, such as designated travel routes and pull-out areas along the river, will be used to reduce user conflicts and to protect soil and vegetation. No developed recreation sites are planned. All forms of dispersed recreation and river use will be enhanced by public ownership. Visual resources will be protected.

Priority Lands No.6 — Carbon County (6195.56 acres)

PROPOSED MANAGEMENT

These lands are within the Grove Creek allotment which are managed under an existing grazing allotment management plan. If the lands were acquired, they would probably be incorporated into and managed under this same plan. There would be increased recreational use of the area, resulting from the improved public access to the area. There could be some minor management changes because of the endangered plant species in the area. Increased minerals activity and associated rights-of-way could occur in this area if Phillips Petroleum Company's proposed well on Ruby Creek is a producer.

RESOURCE IMPACTS

BLM acquisition of the offered Carbon County lands will have minimal or no impact to the following resources:

Air quality
Floodplains
Hazardous Wastes
Wild and Scenic Rivers
Wilderness
Vegetation
Stratigraphy and Geology

Other resource values affected by acquisition of these lands by BLM are as follows.

Socioeconomics

The proposed land exchange would remove 6,195.52 acres from the property tax base of Carbon County and would add the same amount of acreage to the public domain under BLM holdings. At the present time, BLM manages 206,659 acres in Carbon County; therefore, the land exchange would impact total public land holdings approximately 3.0 percent.

Carbon County (including school districts) would lose approximately $709.17 per year in property tax revenues from the exchange. Increased revenues for Carbon County would be from PILT and from grazing fee payments under the Taylor Grazing Act (Appendix 15 contains an explanation of PILT payments). In FY 1988, Carbon County received $322,913 in PILT payments. The additional acreage resulting from the land exchange should add $4,646.67 to the Carbon County PILT Entitlement (the FY 1988 ceiling was $342,000). Grazing fees from the additional acreage are expected to total $1,824.66 of which 12.5 to 50.0 percent would be returned to the county. The overall effect of the land exchange upon revenues of Carbon County and the local school districts are not considered to be significant.

The local economy should benefit directly from expenditures from increased recreational days attributable to the proposed land exchange. BLM estimates that there would be 525 big game hunting days (mostly deer) on these properties from the land exchange in Carbon County (Keith Mosbaugh, personal communication, March 3, 1989). Recent studies by the Montana Department of Fish, Wildlife and Parks (August 1987) indicate that resident deer hunters spend, on the average, $31.11 in out-of-pocket costs per day to hunt deer. This would indicate that the local economy may benefit from $16,330 in annual expenditures from the land exchange, assuming that the participants (hunters) would not be spending income in other endeavors, should they choose not to go hunting.

The total recreational benefit to the public could increase as a result of the proposed exchange. In terms of net economic value as measured by willingness to pay, the estimated total public

recreational benefit could increase by $28,875 based upon $55 per hunter day and an estimate of 525 hunter days on these properties (Keith Mosbaugh, personal communication, March 3, 1989). As a comparison, the total public recreational benefit of deer hunting in southern Montana (area south of the interstate between Billings and Livingston) was estimated to be $825,000 based on 24,807 hunter days (Montana Department of Fish, Wildlife and Parks, August 1987).

No significant impacts would be realized on the social life or community services in Carbon County as a result of the land exchange, primarily because no in- or out-migration would accompany the exchange. There may be an increase in dispersed recreation; however, the effect would be minimal upon the area population.

The exchange from private to public land would have a positive effect on the social well-being of those who engage in dispersed recreational activities (e.g., fishing, hunting, horseback riding, wildlife viewing) by satisfying local and regional demand for recreational use and access. Conversely, adverse impacts on the social well-being of landowners who lease the land for livestock grazing may occur if conflicts concerning land use practices (e.g., gates left open, driving across unroaded rangeland, accidental fires, camping on private lands) arise between recreationists and ranchers.

Transportation

Access for the public will be improved as a result of the exchange. The public would be able to access these lands from the Robinson Draw Road and the Meeteetse Trail Road. Numerous, existing passable trails transverse these properties to provide additional access.

Areas of Critical Environmental Concern

None of the offered lands are adjacent to or considered to be a candidate for an Area of Critical Environmental Concern. Although T.9S.,R.21E, Section 5, N½ is within the Nature Conservancy's Meeteetse-Spires Preserve, which is a proposed Preserve to protect Shoshonea, a rare plant, none of these plants have been found in Section 5.

Cultural Resources

Management of cultural properties by BLM within the selected priority lands will have a beneficial effect. If and when disturbance to areas in such lands is proposed, inventory of disturbance areas, evaluation under the criteria set for nomination to the National Register of Historic Places, and allocation of cultural resource use designation will take place. Any adverse impact will be mitigated and cultural properties will be preserved and protected.

Agriculture

The land will continue to be grazed as part of the Grove Creek allotment. The costs of livestock grazing will be considerably reduced by BLM acquiring these lands.

Native American Religious Concerns

The proposed exchange will have no adverse effects and may have possible beneficial effects on Native American Religious Concerns, since any potential sites will be brought under Federal protection under the American Indian Religious Freedom Act.

Threatened and Endangered Species

Since there are no known threatened and endangered wildlife species utilizing this area, there will be no impacts from the proposed exchange. There will be a beneficial affect to Shoshonea, a rare plant species that has been nominated for threatened and endangered species status. If the lands were exchanged, this rare plant species and area would be protected under BLM management.

Wetlands/Riparian Zones

The portion of Grove Creek within T.9S.,R.21E, Section 1 will continue to be grazed as part of the Grove Creek allotment. There would be more opportunity to intensively manage the riparian along Grove Creek if it were in Federal ownership.

Topography and Soils

As a result of this exchange there may be opportunities for management activities that may result in improved soil and vegetative productivity. Improved soil and vegetative productivity would decrease sheet and rill erosion and would improve the overall watershed condition. No impacts to the overall topography are anticipated.

Wildlife

Acquisition of the subject lands would have a positive impact on multiple-use management and wildlife in this general area in that it would create a substantial block of Federally managed surface. Antelope, mule deer and white-tailed deer habitat would be protected and would be improved by grazing management and wildlife improvement projects. Sage grouse leks and habitat would also be protected.

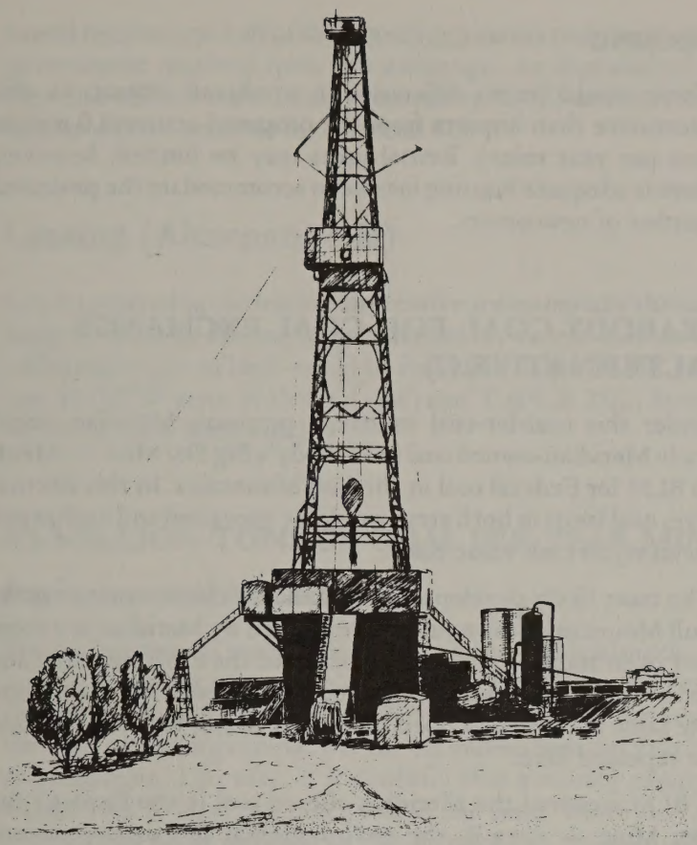
Other Minerals

Oil and Gas

Meridian Minerals will retain oil and gas rights. BLM will be afforded surface property owner rights prior to any oil and gas development.

Mineral Materials/Mining Claims

Mineral material sales and minerals management would be allowed and managed under existing laws, procedures and regulations.



Hydrology

Overall, the change in ownership should have a beneficial effect in the watershed condition on the allotment. The areas were used for grazing before the exchange and this use will probably continue. With BLM's emphasis on management of riparian areas, there may be a slight improvement in the watershed condition.

Recreation

At the present time the rancher permits recreational activity on the offered lands, mainly for deer hunting. The rancher has developed a walk-in hunting area. This management use would continue and probably improve after the exchange. The exchange will insure public access to the area for recreation.

Mirror Image Coal for Coal Exchange (Alternative B)

Under this coal-for-coal exchange proposal, the Federal and Meridian coal in the project area would be split into two logical mining units of approximate equal size and value. Meridian would get one unit; BLM would get the other unit. It should be noted that both units would be equalized in value before an exchange was completed and the exact boundaries of each unit determined.

Merits to this type of exchange would be that both parties would acquire a contiguous block of coal land for mining or lease. A contiguous block of coal would be more economically attractive to potential mining companies because it allows for more compact, efficient mining operations. Also, contiguous blocks of coal (one owner) tend to be more valuable and generate higher bonus bids and rentals than lands divided into a checkerboard pattern.

While it is conceivable that both tracts of coal could be developed at the same time, this is highly improbable. The most likely scenario is the private coal tract would be developed first. The Federal coal tract would probably be leased to the same mining company about fifteen years after the private coal tract was developed, i.e., under a longwall mining operation producing 3.0 million tons of coal per year. Under a room and pillar mining operation, BLM would probably have to lease the Federal coal unit to a second mining company when the coal was economically feasible for development. This probably would not occur until 2020, based on NRET's projections for the coal market. Appendix 11 contains an in-depth discussion of the Bull Mountains coal and its development.

Since the coal lands in this alternative are essentially the same coal lands under the proposed exchange alternative, the environmental impacts from mining these lands will be the same as discussed previously. However, the socio-economic impacts will be different and are discussed below.

Socio-economics (0.5 million tons per year mine)

ECONOMIC ENVIRONMENT

Employment and Income

Employment and income impacts are virtually identical to those described in the 0.5 million tons per year mine scenario under the proposed action Alternative A (Coal for Land Exchange).

Fiscal

Fiscal impacts to Musselshell and Yellowstone counties would be almost identical to those described in the 0.5 million tons per year mining scenario under the proposed action, Alternative A (Coal for Land Exchange). However, under Alternative B (Mirror Image-Coal for Coal Exchange), Federal royalty payments would be available on the acquired coal, should the Federal government be able to lease the coal in the future.

SOCIAL ENVIRONMENT

Demography

The demographic effects of the proposed development would be virtually identical to those described in the proposed action. Because substantial new settlement would not occur due to the development, the few newcomers could assimilate into the existing population without impacts to the demographic characteristics of the study area.

Social Life

The nature and magnitude of potential impacts on community resources, social organization, and social well-being would be similar to impacts presented in the proposed action. Because the communities have experienced population influxes and social changes with other resource-related developments, the small

number of predicted newcomers would have little effect on the social life of the community.

Community Services

The small population increase attributable to the proposed project would not stress community services or facilities. Similar to impacts projected in the proposed action, minor impacts may be experienced by law enforcement and emergency services.

HOUSING

Similar to the proposed action, there is sufficient housing available for the expected number of in-migrants.

Socio-economics (3.0 million tons per year mine)

ECONOMIC ENVIRONMENT

Employment and Income

Employment and income impacts are virtually identical to those described in the 3.0 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange).

Fiscal

Fiscal impacts will to Musselshell and Yellowstone counties would be almost identical to those described in the 3.0 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange). However, under Alternative B, (Mirror Image-Coal for Coal Exchange), Federal royalty payments would be available on the acquired coal, should the Federal government be able to lease the coal in the future.

SOCIAL ENVIRONMENT

Demography

Impacts to demographic characteristics from the proposed development would be similar to the impacts described in the proposed action (3.0 million tons per year mine scenario). It is expected that the in-migrating population would be assimilated into the existing population without impacts to the demographic characteristics of the area.

Social Life

Potential impacts on community resources, social organization, and social well-being would resemble the impacts described in the proposed action. Integration of newcomers should be relatively easy given the history of population influxes resulting from other resource-based developments.

Community Services

Similar to the proposed action, community services would experience minor impacts as a result of the proposed development. Coal traffic during the first two years of operation and increased commuter traffic may moderately stress law enforcement and emergency services in the study area.

HOUSING

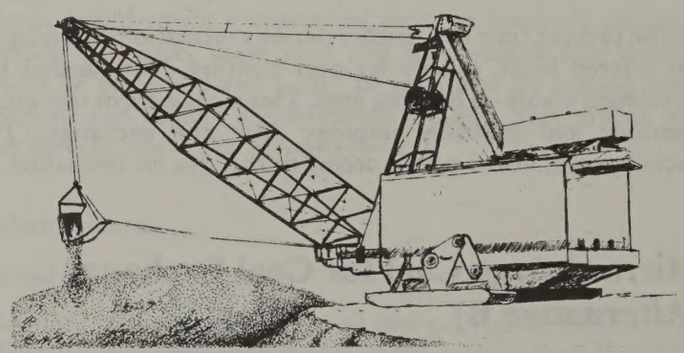
There would be no difference in predicted impacts in this alternative than impacts from the proposed action (3.0 million tons per year mine). Rental units may be limited; however, there is adequate housing for sale to accommodate the projected number of newcomers.

PEABODY COAL-FOR-COAL EXCHANGE (ALTERNATIVE C)

Under this coal-for-coal exchange proposal, Meridian would trade Meridian-owned coal in Peabody's Big Sky Mine — Area B to BLM for Federal coal in the Bull Mountains. In this alternative, coal lands in both areas would be appraised and exchanged on an equal cash value basis.

The most likely development scenario for this alternative is the Bull Mountains coal would be developed by Meridian as a room and pillar mine or longwall mine. Since the environmental and socio-economic impacts associated with these developments are the same as those described previously in this EIS, they will not be repeated here.

If BLM acquired the Meridian offered coal in the Peabody Big Sky Mine — Area B, the environmental and socio-economic impacts to that area would be the same as those described in Chapter 4 of Peabody Big Sky Mine — Area B EIS. Mining in the Peabody Big Sky Mine-Area B would cause moderate impacts to the natural and spiritual qualities of the environment and the social life of the Northern Cheyenne Tribe. Minor impacts would occur to the following: hydrology (ground and surface water), fiscal, employment, income, population, Rosebud County social life, land use, transportation, cultural, aesthetics and noise. Impacts to other resource values such as wildlife and vegetation would be negligible because of mitigation measures which reduce these impacts.



The Federal government would receive royalty payments from Peabody Coal Company for the coal that BLM acquires in the exchange. These royalty payments would be spread over several years and would depend upon the amount of coal that BLM receives in the exchange and when this coal is mined. Mining of the BLM acquired coal could begin as early as the year 2000 and continue through 2012. It is expected that BLM would acquire at least seven million tons of coal as a lower limit or as much as 21.2 million tons of coal as an upper limit. The State of Montana

would receive one-half of the royalty payments that the Federal government received from this exchange. An appraisal of the Meridian offered coal is being prepared by NRET and final value figures will be available for the final EIS.

Leasing (Alternative D)

Lands involved in the leasing alternative are essentially the same lands as those in the exchange alternative, except that several additional tracts of land would be included; T.6N.,R.26E., Section 24 (197.54 acres of Federal coal) and T.6N.,R.27E., Section 16 (640 acres of State coal).

0.5 MILLION TONS OF COAL PER YEAR MINE

Environmental Impacts

For environmental analysis purposes, all the coal lands included under the leasing alternative are addressed in this section, even though it is highly unlikely that BLM would lease all the available coal to a mining company at the 0.5 million tons per year rate of production. Likewise, it is doubtful that a mining company would want to lease this much coal at one time. There are 7,667 acres of coal lands included in this scenario. At the production rate of 0.5 million tons per year, the mining company would have 67.7 million tons of recoverable coal or 135 years of production (Table 4.1).

The environmental impacts of leasing the coal for the small room and pillar mine are essentially the same as the exchange small room and pillar environmental impacts for most resources, except socio-economics which is discussed below. There is a slight difference in environmental impacts because of slightly different lands involved in leasing and the larger area involved but not significant enough to warrant further in-depth discussion.

Socio-economic Impacts

The leasing alternative (D) assumes a project start date of 2020, when coal would become economically feasible to mine at $25 (1990 dollars) a ton. The following impact analysis is based upon the assumption that the baseline projections presented in Chapter 3 would continue through Year 2020. It should be noted, however, that it is extremely difficult to predict with a high level of accuracy impacts that would occur 30 years into the future.

ECONOMIC ENVIRONMENT

Employment and Income

Employment impacts on the local economies would be virtually identical to those described in the 0.5 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange). Projected baseline employment growth rates for the study area indicate that total employment in Musselshell County by Year 2020 would be slightly higher than current levels. Baseline employment in Yellowstone County is projected to grow at an annual rate of 1.4 percent so that, by Year 2020, total employment in Yellowstone County should exceed 100,000. Thus, the impacts due to the mine on the study area employment levels should be slightly less than those described under the 0.5 million tons per year mine scenario under Alternative A-Coal for Land Exchange.

Income impacts on the local economies also would be virtually identical to those described in the 0.5 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange). Inflating study area income levels to Year 2020 should coincide with inflation factors used to project salaries and other expenditures made by the mining company.

Fiscal

Fiscal impacts on local governments due to the mine would be similar to those described in the 0.5 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange). However, State and Federal government revenues would benefit from the receipt of Federal coal royalty fees paid by the mining company. Through the life of the proposed mine, BLM estimates that there would be 7.9 million tons of recoverable Federal coal associated with the lease in Musselshell and Yellowstone counties (Appendix 16). Assuming a start date of 2020 and $25 per ton for coal (1990 dollars), BLM estimates that the present value in 1990 dollars (discounted at 10 percent) of total future royalty payments would amount to $176,941 (Appendix 16). Actual value of the total royalty payments, based upon $25 per ton for coal in 1990 dollars, would be $13,367,592 (Appendix 16). Of these royalty payments, one-half would go to State government (school foundation program) and one-half to the Federal government. In addition, any bonus fees associated with the lease would also be forthcoming.

If BLM were able to lease the Federal coal immediately, and it was developed, and assuming a $15.00 per ton F.O.B. mine and a 1991 startup date, then the present value of the royalty payments discounted to 1990 dollars would be $1,676,763 (Appendix 16). Total royalty payments (1990 dollars) would be $7,985,628 (Appendix 16).

SOCIAL ENVIRONMENT

Demography

Impacts to communities in the study area would be similar to those anticipated under the 0.5 million tons per year mine in Alternative A. Baseline population projections indicate little growth in Musselshell County and Roundup. The number and characteristics of the in-migrating work force would be the same under both the land exchange and leasing alternatives. Thus, it is concluded that the small number of projected in-migrants would be assimilated into the existing population without impacts to the demographic characteristics of the study area.

Social Life

The nature and magnitude of potential impacts on community resources, social organization, and social well-being would resemble the impacts described in the 0.5 million tons per year mine under Alternative A. Social well-being is related to an

individual's ability to maintain a perceived quality-of-life including access to adequate employment, community services, health care, and recreational programs and areas. Since the population, employment, and fiscal conditions are projected to remain relatively stable, quality-of-life indicators should also remain fairly stable.

Those individuals who perceived that a land exchange would create a coal and transportation monopoly may not be threatened by the leasing alternative. For those area residents who oppose any development, an impact to their sense of social well-being would likely occur regardless of whether coal is made available through lease or land exchange. The small numbers of new jobs and in-migrants with this alternative would not provide a significant infusion of local wages into the economy; consequently, those expecting substantial economic recovery may be disappointed. Due to the experience of the community with population fluctuations and social changes as a results of other resource developments, in-migration of the newcomers would have little effect on the social life of the study area.

Community Services

Impacts to community services are associated with population increases. The communities of Billings and Roundup have experienced out-migration from declines in the economies associated with oil, coal, and agriculture, resulting in under utilization of some community services. Baseline projections indicate a slight increase in population in Musselshell County, thus impacts to community services would be the same as presented in the 0.5 million tons per year mine under Alternative A. Minor impacts would include increased mine-related commuter and coal truck traffic.

HOUSING

Housing availability and needs are closely associated with employment and population projections. As employment and population increase, housing needs increase and housing availability decreases. Since projected increases in employment and population in the study area are similar to those described in the 0.5 million tons per year mine scenario under Alternative A, impacts to housing would be the same under the leasing alternative.

3.0 MILLION TONS OF COAL PER YEAR MINE

Environmental Impacts

There are 7,667 acres of coal lands and 108.4 million tons of recoverable coal reserves included in this scenario (Table 4.1). At a production rate of 3.0 million tons of coal per year, the mining company would have 36 years of production.

Likewise, the environmental impacts of the leasing alternative longwall mine will be essentially the same as the exchange alternative longwall mine (Alternative A), except for hydrology and socioeconomics which are discussed below. There is a slight difference in environmental impacts because of slightly different lands involved in the leasing alternative and the larger area involved but not significant enough to warrant further in-depth discussion.

Socio-economics Impacts

The leasing alternative assumes a project start date of 2020, when coal would become economically feasible to mine at $25 (1990 dollars) a ton. The following impact analysis is based upon the assumption that the baseline projections presented in Chapter 3 would continue through Year 2020. It should be noted, however, that it is extremely difficult to predict with a high level of accuracy impacts that would occur 30 years into the future.

ECONOMIC ENVIRONMENT

Employment and Income

Employment impacts on the local economies would be virtually identical to those described in the 3.0 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange). Projected baseline employment growth rates for the study area indicate that total employment in Musselshell County by Year 2020 would be slightly higher than current levels. Baseline employment in Yellowstone County is projected to grow at an annual rate of 1.4 percent so that, by Year 2020, total employment in Yellowstone County should exceed 100,000. Thus, the impacts due to the mine on the study area employment levels should be slightly less than those described under the 3.0 million tons per year mine scenario under Alternative A-Coal for Land Exchange.

Income impacts on the local economies also would be vitually identical to those described in the 3.0 million tons per year mine scenario under the proposed action, Alternative A (Coal for Land Exchange). Inflating study area income levels to Year 2020 should coincide with inflation factors used to project salaries and other expenditures made by the mining company.

Fiscal

Fiscal impacts on local governments due to the mine would be similar to those described in the 3.0 million tons per year mine scenario under Alternative A (Coal for Land Exchange). However, State and Federal revenues would benefit from the receipt of Federal coal royalty fees paid by the mining company. Through the life of the proposed mine, BLM estimates there would be 45.5 million tons of recoverable Federal coal associated with the lease in Musselshell and Yellowstone counties (Appendix 16). Assuming a start date of 2020 and $25 per ton for coal (1990 dollars), BLM estimates that the present value in 1990 dollars (discounted at 10 percent) of total future royalty payments would amount to $1,008,208 (Appendix 16). Actual value of the total royalty payments, based upon $25 per ton for coal in 1990 dollars, would be $76,622,000 (Appendix 16). Of these royalty payments, one-half would go to State government (school foundation program) and one-half to the Federal government. In addition, any bonus fees associated with the lease would also be forthcoming.

If BLM were able to lease the Federal coal immediately, and it was developed, and assuming a $15.00 per ton F.O.B. mine and a

1991 startup date, then the present value of the royalty payments discounted to 1990 dollars would be $9,554,192 (Appendix 16). Total royalty payments (1990 dollars) would be $45,773,000 (Appendix 16).

SOCIAL ENVIRONMENT

Demography

Demographic impacts of the 3.0 million tons per year mine scenario would be equivalent to those described under the 3.0 million tons per year mine in Alternative A. Baseline population projections indicate little growth in Musselshell County and Roundup. Thus, it is concluded that the mine workers and their families would be assimilated into the existing population without significant impacts to the demographic characteristics of the study area.

Social Life

Impacts of the proposed project on community resources, social organization, and social well-being would be similar to the impacts presented in the 3.0 million tons per year mine under Alternative A. Because of the past experiences of the community with cyclic resource developments, many of the social processes and structures and the administrative and political experience necessary to deal with development already exist in Roundup.

Social well-being is related to an individual's ability to maintain a perceived quality-of-life including access to adequate employment, community services, health care, and recreational programs and areas. Since the population, employment, and fiscal conditions are projected to remain relatively stable, quality-of-life indicators should also remain fairly stable.

Positive impacts to the social well-being of area residents may be realized through increased job opportunities and local spending within the community. The leasing alternative would be more desirable to those people who oppose the development under Alternative A because of their fear of a coal and transportation monopoly. Those who oppose development under all circumstances would be adversely affected under any alternative.

Community Services

Stress on community services is directly related to population increases and whether services or facilities are currently being under or over utilized. Baseline projections indicate a slight increase in population in Musselshell County. Similar to impacts on community services described in the 3.0 million tons per year mine under Alternative A, minor impacts to law enforcement and emergency services may be experienced, while other services should be adequate to meet the demands of the projected number of mine-related newcomers.

HOUSING

Housing availability and needs are closely associated with employment and population projections. As employment and population increase, housing needs increase and housing availability decreases. Since projected increases in employment and population in the study area are similar to those described under the 3.0 million tons per year mine scenario of Alternative A, impacts to housing would be the same under the leasing alternative.

Hydrology Impacts

The difference in hydrology impacts on lands involved under the leasing longwall alternative are as follows:

There would be greater potential for subsidence impact in Federal Section 18 due to mining throughout the section in areas with less than 200 feet of overburden, especially if longwall extraction is planned. Some of this impact may be positive; i.e., the possibility of creating an impoundment basin within alluvial material of Rehder Creek is enhanced. At the same time, the only known well currently in use in the area may be impacted; it is presently obtaining water from depths approximating that of the Mammoth coal seam (well PW-012). Water quality associated with this well may be affected due to aquifer disruption during mining, and water levels would drop while mining occurred nearby. Over the long term present groundwater conditions would be re-established with increased permeability attributed to longwall subsidence benefiting well yield. Little impact on springs is anticipated for they are conspicuously absent from Section 18; elsewhere, spring impacts would be similar to that under the coal for land exchange scenario.

The immediate and more widespread application of the longwall method would result in environmental consequences that are more readily identifiable during actual mining, thus hydrological impacts could be corrected immediately and long-term effects would not become a problem in the future.

No Action (Alternative E)

ENVIRONMENTAL IMPACTS

The No Action alternative (Alternative E) would continue present management as it exists now for all the lands. Under this alternative the exchange(s) would be denied as well as the leasing. BLM and Meridian coal lands would remain in a checkerboard pattern in the Bull Mountains. There would probably be no development of the Federal coal.

All environmental impacts associated with development of the coal would be avoided, such as subsidence or transportation, as well as any adverse impacts that would result from leasing or the exchange of the offered lands or coal into Federal ownership.

SOCIO-ECONOMIC IMPACTS

Economic Environment

EMPLOYMENT

If the land exchange were denied and the leasing alternative was not selected as a viable option, employment in the area would not change from the baseline forecast.

INCOME

Under the "No Action" alternative, earnings in the area would remain as projected in the baseline forecast.

Fiscal

Fiscal conditions in the area would not change if the land exchange or leasing alternative were denied.

SOCIAL ENVIRONMENT

Demography

If the project were not developed, the anticipated influx of workers and their families into the area would not occur. Therefore, no change in the demographic characteristics of the community would be realized.

Social Life

Although there would be no mining development with the "No Action" alternative, some social impacts have already taken place. The potential of coal development has factionalized some elements of the community based upon support or opposition to the project. Nondevelopment would be welcomed by those opposed to the project. Individuals who opposed the project may derive satisfaction from their efforts in blocking the development and may consider the quality of their lives preserved. They may, however, harbor ill feelings toward those in favor of the development thus increasing the social distance between the groups opposing and favoring the project.

Those with strong views for the project would likely resent, to some extent, those with opposing views. The decision not to develop the mine could be perceived by those who favor the project as being influenced by the anti-development faction. Because the expected jobs, wages, and associated economic benefits would not materialize without the project, those opposed to the project would be viewed as impeding much-needed economic development in Musselshell County.

Anticipation that the project would be developed also may cause other social impacts. Some residents without jobs may remain in the Roundup area, thinking that the mine would be developed and provide employment. Rather than moving to an area where jobs are more plentiful, some unemployed or underemployed people may eke out an existence on welfare or with public assistance until the mine opens, anticipating employment opportunities.

In general, the Roundup area residents believe the mine would provide a much-needed boost to the economy. Not developing the project would be a disappointment to many. Anxiety and a loss of optimism, that may accompany unfulfillment of the expectation that Roundup would experience economic improvement, would decrease the feeling of community well-being.

Anticipation of a project also may cause some businesses to expand their inventories or facilities. Without the project, these businesses would not be able to recover their costs incurred as a result of this speculation.

Community Services

Denial of the land exchange and subsequent coal mine development should not impact the quality of services provided to the community.

Housing

No impacts to housing in the area are expected under the "No Action" alternative.

OPPORTUNITIES FOREGONE

Opportunities for BLM acquisition of the Meridian offered lands would be foregone as well as management opportunities of the resources associated with these properties if the exchange were denied. Likewise, opportunities associated with leasing the Federal coal, such as economic development, royalty payments, etcetera, would be lost if leasing were denied.

LIKELY FUTURE OF THE COAL

If the No Action alternative became BLM's final decision, the ownership pattern for the coal lands would remain as it exists today. The Federal coal lands would not be developed at this time, nor in the foreseeable future. Further development of Federal coal by the Divide/Storm King mine is an unlikely occurrence. In summary, the Federal coal reserves probably would not be mined anytime in the foreseeable future and would most likely remain undeveloped.

The likely future of the private coal lands in the Bull Mountains would probably be the same as the Federal coal, i.e., undeveloped for quite a while into the future. While Meridian and other private interests have considerable coal reserves in the Bull Mountains, development of these coal reserves to any large scale requires some cooperation from the Federal government (BLM), primarily because of the checkerboard ownership pattern. Based on this and the high costs involved to open a new mine, there would likely be no new development of private coal reserves in the Bull Mountains. The PM Coal Mine would probably continue to mine private coal reserves at their existing small-scale operation for local use.

The likely future of the private coal offered as part of the coal-for-coal Peabody exchange will remain the same. This coal is within the Peabody mine Coal Company's Area B mine. The Area B mine is a new area that Peabody intends to mine. The State of Montana has approved Peabody's mine plan permit and the company has started construction on the mine. The likely future of this offered private coal will be that the coal will be mined 10 to 15 years hence, regardless of ownership. In other words, the chances are good that an established coal company (Peabody) will remain in business and will mine this offered coal, regardless of who owns the coal.

The likely future of the State coal reserves will be the same as the other Bull Mountains coal, undeveloped. The State coal lands, T.6N.,R.27E., Section 16 are in the 20 to 30 year range for

the mine plan anyway. It is doubtful that these State coal reserves would be mined any sooner than that at the earliest. If the Federal and private coal were undeveloped, this State coal would not be developed by itself.

LIKELY FUTURE OF THE OFFERED PRIVATE LANDS

Priority Lands Nos.1,2 and 3 — Madison County (697.45 acres)

The owner of record of these lands will continue to lease these lands for livestock grazing and this use will probably not change under the present ownership. However, Plum Creek Timber Company has indicated they are going to dispose of these tracts. If these tracts are sold, a good chance exisits that all three parcels would be developed for second homes or vacation homes. This is the current trend of private lands along the Madison River.

Priority Lands No. 4 — Custer County (640 acres)

Although these lands could remain in Glacier Park Company ownership, they will more than likely be sold to other private interests. Glacier Park Company is presently disposing of their private grazing lands in this area so it would be safe to assume that these lands would eventually be sold to other private interests. The present land use, livestock grazing, would probably continue, regardless of ownership.

Priority Lands No.5 — Deer Lodge/Beaverhead Counties (1475.48 acres)

The most likely scenario for these lands is sale to another private party for ranching or private hunting use. Current public use would be lost as well as public access to adjacent National Forest Lands. Extensive timber harvest could occur but is unlikely due to physical access problems.

Priority Lands No.6 — Carbon County (6195.56 acres)

Although these lands could remain in Glacier Park Company's ownership, they will more than likely be sold to other private interests. Glacier Park Company is presently disposing of their private grazing lands in this area so it would be safe to assume that these lands would eventually be sold to other private interests. The present land use, livestock grazing, would probably continue, regardless of ownership.

Mitigation Measures

The possible exchanges and/or lease of the Federal coal lands itself causes relatively insignificant impacts. It is only when the Federal coal is developed that the significant impacts occur that could require mitigation. This section addresses possible mitigation measures that could be implemented by the various Federal and State agencies involved in the permitting process to reduce or lessen the impacts of development of the Bull Mountains coal. Most of these measures, if adopted, would be implemented and enforced as covenants to a deed or as stipulations to an approved mine plan.

The following measures are standard mitigation measures that would probably be required as part of the mine plan permit approval process or to comply with the various Federal, State and County laws and regulations.

(1) The mining company would protect all survey monuments, witness corners and reference monuments from destruction or damage from mining operations. Any damaged or destroyed monuments would be replaced by a registered land surveyor and recorded appropriately.

(2) Any coal development would be subject to valid existing rights on Federal and State lands, e.g., rights of way, oil and gas leases, etcetera.

(3) Any surface use of Federal and State lands would be permitted and subject to appropriate restrictions and stipulations of the authorizing agency.

(4) Reclamation of areas of surface disturbance would be accomplished as soon as possible. All reclamation would conform to applicable State/Federal laws and regulations regarding spoil material, topsoil placement, seeding and grading.

(5) The mining company would make every reasonable effort to avoid or where avoidance is impracticable, minimize dust problems. This may necessitate sprinkling, oiling or other means of dust control on roads, trails, etcetera. The mining company would conduct processing so as to prevent, or if prevention is impossible, minimize to the maximum extent possible, environmental or health problems associated with dust.

(6) Before undertaking any activities that may disturb the surface of the Federal lands, the mining company would conduct an intensive field inventory for cultural resources on portions of the mine plan area and adjacent areas that may be adversely affected by mine-related activities and which have not been previously inventoried at such a level of intensity, e.g., rock art sites.

The mining company would protect all cultural resource properties within the mine area from mine-related activities until cultural resource mitigation measures could be implemented as part of an approved mining and reclamation plan.

The cost of conducting the cultural resource inventory, preparing reports and carrying out mitigation measures would be borne by the mining company.

All cultural resources would remain under the jurisdiction of the United States until ownership is determined under applicable law.

(7) Before undertaking any activities that may disturb the surface of any Federal lands, the mining company would contact the surface management agency to determine whether they would be required to conduct a paleontological appraisal of the mine plan and adjacent areas, which may be adversely affected by mine-related activities. If the agency determines that an

inventory is necessary, the paleontological appraisal would be conducted by a qualified paleontologist.

The mining company would not knowingly disturb, alter, destroy or take any larger and more conspicuous fossils of significant scientific interest and would protect all such fossils in conformance with the measures included in the approval of the mining and reclamation plan.

The mining company would immediately bring to the attention of the regulatory agency or BLM, as appropriate, any such fossil discovery that might be altered or destroyed by their operation. Operations may continue as long as the fossil specimen or specimens would not be seriously damaged or destroyed by the activity. The regulatory agency or BLM, as appropriate, would evaluate or have evaluated such discoveries brought to their attention and would notify the mining company what action should be taken with respect to such discoveries.

All such fossils of significant scientific interest would remain under the jurisdiction of the United States until ownership is determined under applicable law. Copies of all paleontological resource data generated as a result of any mine plan requirements would be provided to the regulatory agency or BLM as appropriate.

(8) The mining company would be required to conduct a survey for threatened and endangered species on the mine permit area. If any threatened or endangered species are identified, the mining company would develop a mitigation plan acceptable to the United States Fish and Wildlife Service.

(9) The mining company would be required to conduct a four season wildlife inventory. If crucial wildlife habitat would be affected by mining operations, the mining company would develop a mitigation plan acceptable to the Montana Department of Fish, Wildlife and Parks.

(10) In accordance with State law and regulation, the mine plan submittal would address the effects of possible mined land subsidence and faulting, including measures that would minimize these effects.

(11) The mining company would be required to develop equal or better water facilities to replace existing water facilities disturbed or destroyed by mining.

(12) Construction sites would be maintained in a sanitary condition at all times; all wastes would be disposed of promptly at authorized waste disposal sites.

The following measures are additional mitigation measures that could be required to minimize the impacts of the development of the coal.

(1) The Federal coal would only be developed by underground mining techniques.

Note: This mitigation measure has already been agreed to by Meridian Minerals Company.

(2) Several areas were identified as unsuitable for underground longwall mining. On those areas, the mining company could be required to develop mitigation measures to insure protection of the general public and appropriate resources before an exception could be applied.

(3) The mining company could be required to develop a socio-economic mitigation plan to offset housing, education, health services and facilities and services impacts.

(4) The mining company could be required to develop a transportation mitigation plan to offset the immediate impacts from hauling the coal by truck along the proposed haul route and the long term effect of building the proposed railroad.

(5) The mining company could be required to prepare a hydrologic mitigation plan which would address the following:

> Appropriate characteristics of the surface and ground waters, which may include: yield or flow, conductance, pH, temperature, alkalinity, total dissolved solids, dissolved amounts of such elements as sulfates, chlorides, barium, cadmium, copper, iron, lead, radioactive materials, turbidity and total dissolved oxygen.
>
> Identification of development activities that would affect the above waters and the probable impact to such waters from each activity.
>
> Identification of proposed mitigation measures to reduce the hydrological impacts from development.
>
> A plan for monitoring surface and groundwater conditions in the project area and downstream from the project.

(6) All aboveground structures not subject to or otherwise conflicting with safety requirements could be required to be painted by the mining company to blend with the natural landscape.

CHAPTER 5
CONSULTATION AND COORDINATION

Preparation

The Bull Mountains Exchange EIS was prepared by specialists from the Miles City District Office, Butte District Office, contracted consultants, with assistance and guidance from the Montana State Office. The following skills and disciplines were used in the development of this EIS: geology, mining engineering, range and vegetation, forestry, recreation, soils, cultural resources, wildlife, fisheries, hydrology, sociology, economics, graphics and typing. Air quality, hydrology and the socio-economic portions of the EIS were prepared by contract consultants with BLM specialists providing review and quality control of their work. A Federal Register Notice of Intent to prepare an EIS was published in May 1988; writing of the EIS began in February 1989.

Public Involvement

Public participation was conducted during the development of the EIS. Scoping was conducted at public meetings in Roundup and Ennis, Montana. Many people attended the public meetings. Thirty-six people gave oral comments and 26 people or groups gave written comments.

A scoping brochure was also distributed to all interested parties, soliciting their comments on the proposal and the EIS. Specific comments were given on what the EIS should examine, the relative importance of different issues and how or why the public interest may or may not be served. A total of 432 comments were recorded from the brochures and public meetings.

At the Powder River Regional Coal Team meeting in December 1988, it was requested that BLM set up an informal working group of representatives of the various interested parties. The purpose of the working group was to assist BLM in resolving conflicts, problems and issues by offering recommendations and guidance. The project manager met with all the interested parties and organizations during February and March 1989. Each interested party selected one representative and the working group met in April 1989. Future meetings will be held as the project progresses.

An informal open-house meeting was also held in Roundup, Montana during May 1989. The purpose was to answer questions and concerns from the public about the project, to advise them of the status of the EIS, and the forthcoming public meetings. News releases and display advertisements announcing the meetings and locations were issued to the media servicing the general area of the meetings.

Agencies and Organizations Consulted

The Bull Mountains EIS team consulted and/or received comments from the following organizations during the preparation of the draft EIS:

Bull Mountains Landowners Association
Bureau of Indian Affairs
Carbon County Commissioners
Crow Indian Tribe
Custer County Commissioners
Department of Justice
Ennis Chamber of Commerce
Fergus Electric Cooperative
Fishing and Floating Outfitters Association
Governor of Montana
Interstate Commerce Commission
Madison County Commissioners
Montana Coal Council
Montana Department of Fish, Wildlife and Parks
Montana Department of Health and Environmental Sciences
Montana Department of Highways
Montana Department of Natural Resources and Conservation
Montana Department of Revenue
Montana Department of State Lands
Montana Historical Society
Montana Office of Public Instruction
Musselshell County Commissioners
Musselshell Economic Development Corporation
Northern Plains Resource Council
Office of Surface Mining
Ruby Valley Sportsman Association
Shepherd School District
U.S. Fish and Wildlife Service
Yellowstone County Commissioners

Distribution of EIS

Copies of this EIS are being provided to approximately 400 persons, groups, local governments and agencies that have expressed interest in the Bull Mountains Exchange. The mailing list was compiled using names and addresses of:

(1) parties actively involved in past planning and environmental analysis activities,

(2) parties responding to our call for suggested issues and resource information,

(3) parties requesting further information during the preparation of the plan,

(4) agencies, governments and corporations potentially affected by the plan, and

(5) agencies, groups and tribes consulted during preparation of the EIS.

List of Preparers

The following people wrote or were involved with preparing this EIS:

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M.S. Forestry, University of Georgia
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State Office Printing and Graphics Staff

APPENDIX 1

SUMMARY OF PUBLIC COMMENTS AND CONCERNS

Public comments were individually categorized and tabulated. Thirty separate categories of concern were identified. These are listed below under four major issue groups, with the number of comments each received.

Physical Resource/Environment	
Water Quality	21
Air Quality	3
Environmental	6
Other Resource Concerns	18
Threatened or Endangered Species	2
Land Use	1
Cultural Inventory & Compliance	2
Reclamation	3
Data Adequacy	3

BLM Policy/Management	
Public Interest	48
Leasing	8
Planning	5
Management Benefit	1
Management Policy	13
Land Access	11
Lessee Protection	4
Alternative Proposals	32
Procedures	13
No Substantive Comment (Comment Noted)	47

Economic/Business	
Monopoly	57
Equalized Values	31
Economic Benefits/Impacts	44
Employment	4
Mining Operations	11
Mining History	1

Infrastructure/Social	
Road Deterioration	1
Road Condition	1
Safety	11
Social Change	8
Transportation	22

APPENDIX 2

MAJOR FEDERAL, STATE AND COUNTY AUTHORIZING ACTIONS

Federal Government

U.S. Department of the Interior
Bureau of Land Management
Nature of Action: Grant Federal coal lease or exchange Federal coal lands.

United States Fish and Wildlife Service
Nature of Action: Issue a biological opinion on threatened, endangered, or proposed species of fish, wildlife or plants as part of Section 7 of the Endangered Species Act of 1973.

Mine Safety and Health Administration
Nature of Action: Issue permit that covers roof control, ventilation and other aspects of operational safety.

Department of the Treasury
Bureau of Alcohol, Tobacco and Firearms
Nature of Action: Issue permit(s) to purchase, store and use explosives.

Federal Communications Commission
Nature of Action: License to operate industrial radio service.

State of Montana

Department of State Lands
Commissioner, Department of State Lands
Nature of Action: Issue underground mining permit.

Board of Land Commissioners
Nature of Action: Grant State coal lease.

Department of Health and Environmental Sciences
Air Quality Bureau
Nature of Action: Issue Air Quality Permit for Sources of Air Pollution.

Nature of Action: Issue Open Burning Permit.

Water Quality Bureau
Nature of Action: Issue Montana Pollutant Discharge Elimination System (MPDES) permit.

Solid Waste Management Bureau
Nature of Action: Issue Non-hazardous Solid Waste Management System license.

Occupational Health Bureau
Nature of Action: Issue Noise permit.

Department of Highways
Field Maintenance Bureau
Nature of Action: Issue Road Approach permit.

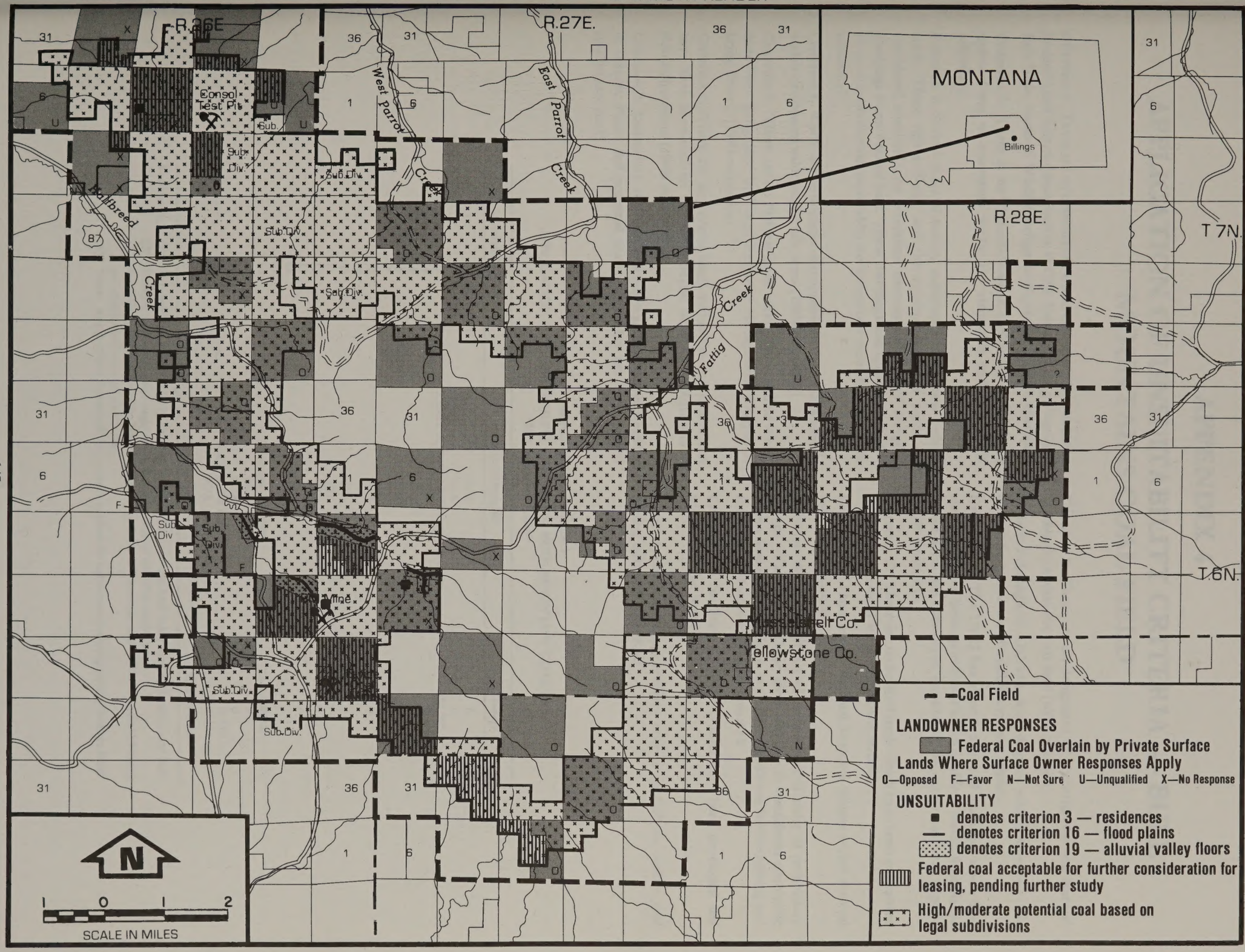
Department of Natural Resources and Conservation
Water Resources Division, Engineering Bureau
Nature of Action: Approve dam design.

Montana Historical Society
State Historic Preservation Officer
Nature of Action: Issue Montana Antiquities Act permit.

Local

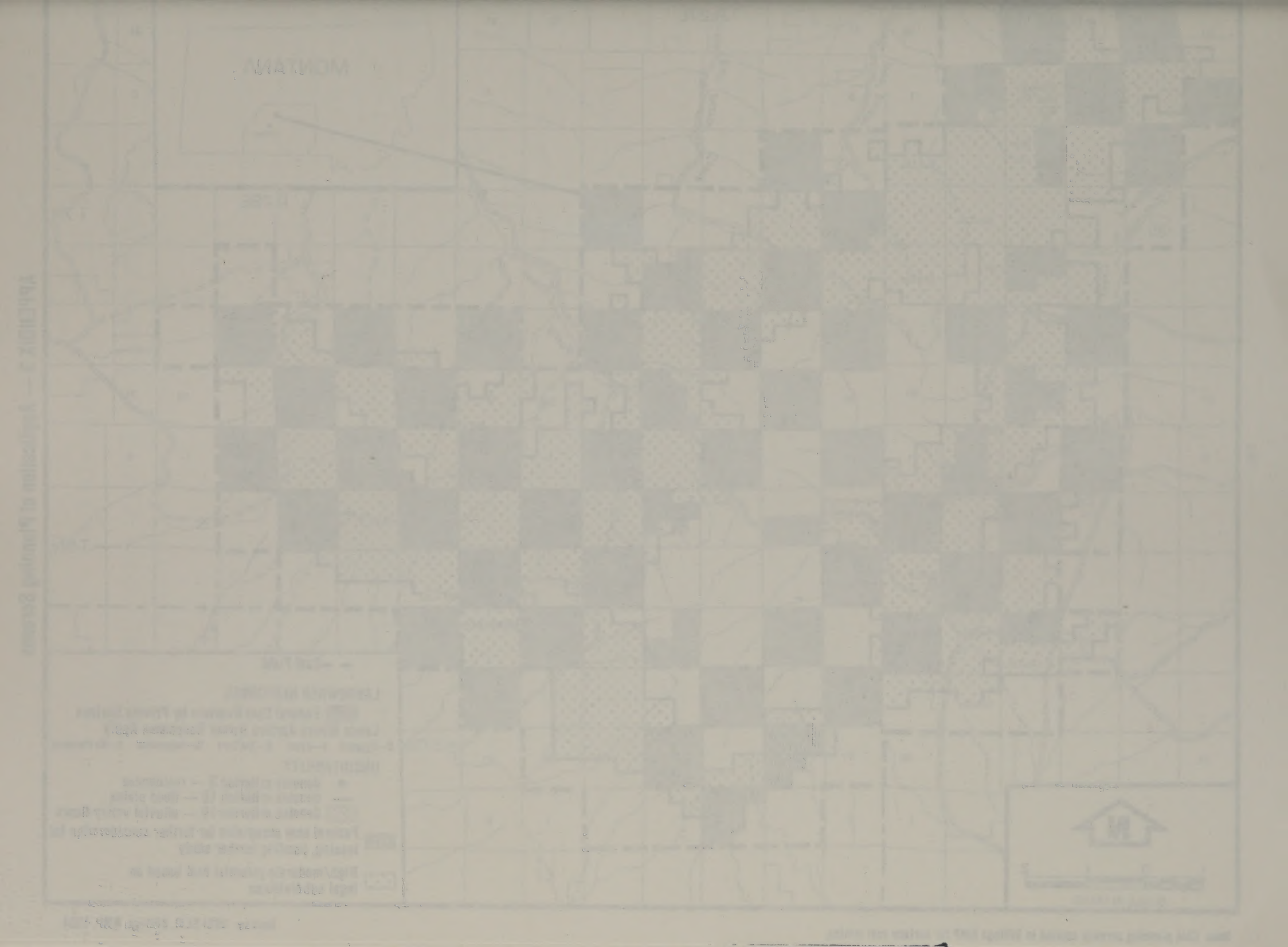
Yellowstone/Musselshell County
Nature of Action: Issue road relocation permit.

Nature of Action: Issue building permits.



Note: Coal planning screens applied in Billings RMP for surface coal mining.

Source: USDI-BLM, Billings, RMP, 1984



APPENDIX 4

APPLICATION OF UNSUITABILITY CRITERIA — BULL MOUNTAINS COAL FIELD

Criterion 1: There are no deposits of Federal coal which lie within the Federal Land Systems described in 43 CFR 3461.1(a)(1), e.g., National Park lands, National Wildlife Refuge lands, etcetera, (100% reliability).

Criterion 2: There is no Federally-owned surface encumbered by rights-of-way or easements within the strippable coal area (100% reliability).

Criterion 3: Several miles of county maintained roads cross Federal lands. These rights-of-way and the appropriate buffer zones are considered unsuitable; no exceptions were applied. Several occupied dwellings lie on Federal land. These dwellings and appropriate buffer zones are considered unsuitable; no exceptions were applied (100% reliability).

Criterion 4: There are no deposits of strippable Federal coal which lie within designated wilderness study areas (100% reliability).

Criterion 5: There are no Federal lands within the coal field which have been designated by Visual Resource Management Analysis as being Class I. (100% reliability).

Criterion 6: There are no Federal lands within the coal field which have been permitted for use for scientific study, e.g., Agricultural Research stations (100% reliability).

Criterion 7: Due to lack of adequate inventory, the National Register of Historic Places and potential sites criterion has not been applied (inadequate data).

Criterion 8: There are no designated or potential National Natural Landmarks within the coal field (100% reliability).

Criteria 9 through 15: Due to lack of adequate wildlife inventory, the criteria for protection of wildlife were not applied.

Criterion 16: The USGS has identified several drainages which flow through Federal lands, portions of which qualify as special floodplains. These areas are considered unsuitable; no exceptions were applied (100% reliability).

Criterion 17: There are no Federal lands which have been committed for use as municipal watersheds (100% reliability).

Criterion 18: There are no National Resource Waters within the coal field (100% reliability).

Criterion 19: The BLM has identified several miles of preliminary alluvial valley floors. These areas will not be considered unsuitable until a final determination is made by the Office of Surface Mining and the State of Montana (data preliminary).

Criterion 20: No State proposed criteria have been developed and adopted by the Secretary.

Note: Application of unsuitability criteria applied for surface coal mining during Billings RMP.

APPENDIX 4 — TABLE 1
APPLICATION OF UNSUITABILITY CRITERIA — BULL MOUNTAIN COAL FIELD
(20:1 Stripping Ratio)

Unsuitability Criterion	*Acres Unsuitable*	*Tonnage*
1	N/A	0
2	N/A	0
3	0 miles of road; 3 buildings; 24 acres	350,000
4	N/A	0
5	N/A	0
6	N/A	0
7	(2)	
8	N/A	0
9	(2)	
10	(2)	
11	(2)	
12	(2)	
13	(2)	
14	(2)	
15	(2)	
16	2½ miles: 96 acres	1,500,000
17	N/A	0
18	N/A	0
19	5 miles: 298 acres	0 (3)
20	N/A	0
TOTAL	120 acres	1,850,000 tons

Footnotes:
(1) Assume 11 feet of coal for Mammoth-Rehder; 8 feet of coal McCleary bed; 1,711 tons/acre foot.
(2) Criteria which have not been applied due to lack of available inventory.
(3) Final determination of alluvial valley floors by State of Montana and Office of Surface Mining not completed; no coal eliminated.
(4) Note: Application of unsuitability criteria applied for surface coal mining during Billings RMP.

APPENDIX 4 — TABLE 2
APPLICATION OF COAL UNSUITABILITY CRITERIA — BULL MOUNTAIN COAL FIELD
(10:1 Stripping Ratio)

Criterion	*Acres Unsuitable*	*Tonnage*
1	N/A	0
2	N/A	0
3	2 occupied dwellings; 16 acres	240,000
4	N/A	0
5	N/A	0
6	N/A	0
7	(2)	
8	N/A	0
9	(2)	
10	(2)	
11	(2)	
12	(2)	
13	(2)	
14	(2)	
15	(2)	
16	1.2 miles: 50 acres	750,000
17	N/A	0
18	N/A	0
19	1.2 miles: 180 acres	0 (3)
20	N/A	0
TOTAL	17 acres	1,000,000

Footnotes: (1) Assume 11 feet of coal for Mammoth-Rehder; 8 feet of coal McCleady bed; 1,711 tons/acre foot.
(2) Criteria which have not been applied due to lack of available inventory.
(3) Final determination on alluvial valley floors by State of Montana and Office of Surface Mining not completed; no coal eliminated.
(4) Note: Application of unsuitability criteria applied for surface coal mining during Billings RMP.

APPLICATION OF REMAINING UNSUITABILITY CRITERIA (Within the Project Area)

Criterion 1: There are no deposits of Federal coal which lie within the Federal Land Systems described on 43 CFR 3461.1(a)(1) (100% reliability).

Criterion 2: Approximately 1.3 acres of Federal coal would be unsuitable for longwall mining in T.6N.,R.27E., Section 32, S½NE¼ and NW¼SE¼ for the Fergus Electric Cooperative power line right-of-way. An exception will require a written agreement from Fergus Electric Cooperative to relocate the right-of-way.

Criterion 3: Approximately 1.5 acres would be unsuitable for longwall mining in T.6N.,R.27E., Section 18, NW¼NW¼ for the Fattig Creek Road. An exception will require consent and approval from the Musselshell County Commissioners. Approximately six acres would be unsuitable for longwall mining in T.6N.,R.27E., Section 18, NW¼ for an occupied dwelling. An exception will require consent and approval from the owners of this home.

Criterion 4: There are no deposits of strippable Federal coal which lie within designated wilderness study areas (100% reliability).

Criterion 5: There are no Federal lands within the coal field which have been designated by Visual Resource Management Analysis as being Class I (100% reliability).

Criterion 6: There are no Federal lands within the coal field which have been permitted for use for scientific study (100% reliability).

Criterion 7: This criterion (cultural resources) will be addressed at the mine plan permit stage.

Criterion 8: There are no designated or potential National Natural Landmarks within the coal field (100% reliability).

Criterion 9: There is no known critical habitat for Federal threatened and endangered species within the Federal coal lands.

Criterion 10: There is no known critical habitat for State threatened and endangered species within the Federal coal lands.

Criterion 11: There are no known bald or golden eagle nests within the Federal coal lands.

Criterion 12: There are no known bald or golden eagle roost and concentration areas within the Federal coal lands.

Criterion 13: There are no known falcon cliff nesting sites within the Federal coal lands.

Criterion 14: There is no known high priority habitat for migratory bird species of high Federal interest within the Federal coal lands.

Criterion 15: There is no known critical habitat for State resident fish and wildlife species within the Federal coal lands.

Criterion 16: Approximately 24.5 acres would be unsuitable for longwall mining in T.6N.,R.27E., Section 18, NW¼NW¼ for the floodplain along the upper reaches of Rehder Creek. No exceptions were applied.

Criterion 17: There are no Federal lands which have been committed for use as municipal watersheds.

Criterion 18: There are no National Resource Waters within the coal field.

Criterion 19: Approximately 24.5 acres were identified as a preliminary alluvial valley floor (data preliminary) in T.6N.,R.27E., Section 18, NW¼NW¼. The area was not considered unsuitable for longwall mining until a final determination is made by the Office of Surface Mining and the State of Montana. These same lands were excluded as unsuitable for longwall mining by unsuitability criterion No.16.

Criterion 20: No State proposed criteria have been developed and adopted by the Secretary.

Source: United States Department of the Interior, Bureau of Land Management, 1984. Billings RMP.

APPENDIX 5

PREDICTION OF SUBSIDENCE CAUSED BY UNDERGROUND MINING IN THE BULL MOUNTAINS

Prepared by

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Subsidence—Regulatory Aspects

Subsidence is defined as a lowering of surface elevations over an udergground mine caused by loss of support and subsequent settling or caving of strata lying above the mine (43 CFR 3480.0-5(36)). Subsidence and other surface effects of underground coal mining operations are regulated by Public Law 95-87, entitled The Surface Mining Control and Reclamation Act of 1977 (SMCRA). Pursuant to SMCRA, rules and regulations have been promulgated by the Office of Surface Mining (OSM) and by the Montana Department of State Lands (DSL) by which underground mine operator's compliance with the law will be judged.

Section 516(b)(1) of SMCRA states that ". . . a mine operator shall be required to adopt measures consistent with known technology in order to prevent subidence causing material damage to the extent technologically and economically feasible, maximize mine stability, and maintain the value and reasonably forseeable use of such surface lands, except in those instances where the mining technology used requires planned subsidence in a predictable and controlled manner."

The only absolute prohibition in SMCRA against subsidence can be found in Section 516(c) which states, "In order to protect the stability of the land, the regulatory authority shall suspend underground coal mining under urbanized areas, cities, towns and communities and adjacent to industrial buildings, major impoundments or permanent streams if he finds imminent danger to the inhabitants of the urbanized areas, cities, towns and communities. In addition, 43 CFR 3461.2(a) states that "Where underground mining will include surface operations and surface impacts on Federal lands to which a criterion applies, the lands shall be assessed as unsuitable unless the surface management agency finds that a relevant exception or exemption applies."

In regard to subsidence affecting the hydrologic system, Section 516(b)(9) of the Act states that ". . . a mine operator shall minimize the disturbance of the prevailing hydrologic balance at the minesite and in associated offsite areas and to the quantity of water in surface ground water systems both during and after coal mining operations and during reclamation . . .". Although required for surface mines, SMCRA and the current Federal regulations do not require underground coal mine operators to provide alternate sources of water to replace those adversely affected by such mining. The new proposed State regulation would require replacement of the affected water supply.

At this time OSM is considering modifying its rules in the detemination of whether subsidence is a surface effect of underground mining to be prohibited under Section 522(e) of SMCRA.

The following analysis is somewhat generic in that no specific mining plans have been submitted. Subsidence is an important factor in designing an underground mine and can be more accurately predicted and, if necessary, mitigated when a complete mining and reclamation plan is developed and submitted for consideration to the regulatory authority.

SUBSIDENCE—GEOLOGIC FACTORS

The coal in the Bull Mountains is in the Tongue River Member of the Fort Union Formation (Paleocene). The Tongue River Member consists of fine- to medium-grained massive sandstone and siltstone and interbedded with a large proportion of shale, silty shale and carbonaceous shale. Numerous coal seams are present in the Tongue River Member.

In general the area lies in a broad syncline with an east-west trend. The regional structure dips one to four degrees. Locally, within the area of interest the structural trend is a 0.8° dip to the north. There are no known major faults in the area.

As noted above there are numerous coal seams in the area but only the Mammoth seam is of sufficient thickness to be considered mineable. It ranges from 8 to 15 feet in thickness, averaging about 10 feet thick. In general the Mammoth seam is thinner to the west and thicker to the east where it merges with the overlying Rehder seam. Conversely the interburden between these two seams is thicker to the west and thinner to the east.

The overburden above the Mammoth generally consists of interbedded shales, sandstones and siltstones. Sandstones account for approximately 40 percent of the total. Much of the sandstones are in massive beds some approaching 60 feet in thickness. In particular there is a massive bed of sandstone immediately over the Mammoth seam and another one about 100 feet above the Mammoth which will be very important in regard to subsidence and mine roof stability. Immediatly beneath the Mammoth seam is generally a thin bed of shale underlain by more sandstone.

SUBSIDENCE—ENGINEERING FACTORS

Among the many factors which have a bearing upon the probability and extent of subsidence, the most important are width of

coal extraction, depth and nature of the overburden, and the thickness of coal removed. The width of coal extraction depends entirely on the mining method being employed. Being considered in regard to the return of underground coal mining in the Bull Mountains are the standard room and pillar and the longwall methods of mining.

One mining method being considered to underground mine the Mammoth-Rehder seam of southern Musselshell and northern Yellowstone counties is by the standard room and pillar mining method utilizing continuous mining machines and shuttle car/conveyor belt haulage to move the coal to the surface. In the room and pillar system of mining, a partial extraction method, about 50 percent of the coal is recovered by two intersecting sets of parallel entries, usually nearly perpendicular to one another. The result is a checkerboard array of coal pillars which will remain to support the roof strata.

Access to the coal seam will be by five main headings being driven on 70-foot centers with mining widths of 18 to 20 feet depending on local roof conditions. This method will leave coal pillars 50 to 52 feet wide to support the roof over the main entries. These headings which contain the conveyor belt, air courses, utilities and minertrip/supply routes will be driven from the portal site on the western edge of the coal field to the eastern limit of the mine. Barrier pillars 300-feet wide will be left between the main entries and the mining panels. These mining panels will then be developed southward from the main entries on 50-foot centers. Room widths will remain at 18 to 20 feet while coal pillars are reduced to 30 to 32 feet to increase resource recovery. There are no current plans for secondary mining, i.e. pillar robbing, which would increase room widths.

The other mining method being considered in regard to underground mining in the Bull Mountains is the longwall method which can recover approximately 85 percent of the coal resource. Access to the coal seam under the longwall scenario will be much the same as the room and pillar mine previously described except that the main entries will be directed more to the northeast. The longwall panels will then be developed on both sides of the main entries to the southeast and northwest.

In longwall mining a block or panel of coal approximately 600 feet wide is isolated by two sets of parallel entries driven by continuous mining machines. The lengths of the panels are variable, but usually determined by geologic or engineering considerations. The longwall mining equipment consisting of a plow or shearer used to break the coal from the coal face; a face conveyor belt to transport the coal away from the face; and a mobile roof support system are placed at the far end of the longwall panel and the coal mining face retreats toward the panel entries. The roof support system temporarily supports the overlying strata as the coal is being severed from the face. It also retreats, thus allowing the roof to cave behind the longwall equipment. Planned subsidence is an integral part of longwall mining.

PROBABILITY OF SUBSIDENCE

The makeup of the overburden in the Bull Mountains is generally favorable for the room and pillar method of underground mining. The presence of the massive sandstone directly above the Mammoth seam will provide a very stable roof when supported by the coal pillar system previously described. Most of the underground mines in the Bull Mountains 30 to 50 years ago used this room and pillar mining method with very good success.

Sinkhole subsidence is often associated where room and pillar mining has taken place under 200 feet of overburden (Dunrod, 1978). If any surface expression of subsidence as a result of room and pillar mining in the Bull Mountains were to become noticeable it would be in the form of "sinkholes" located between the coal cropline and the two hundred foot overburden line. The Montana Department of State Lands, Abandoned Mine Lands Program reports that of 35 mine site repair projects in the Bull Mountains only two involved repair of surface subsidence damage (Mundie, 1989). The surface damage needing repair occurred over mined areas where the overburden ranged from 30 to 40 feet in thickness. These sinkholes were on the order of 20 to 30 feet in diameter and about 15 feet deep.

At this point it may be helpful to the reader to review the theoretical processes which are believed to occur when a portion of the coal seam is mined in an underground coal mine. When an underground opening is established, the original equilibrium is disturbed with resultant stress concentrations. While many factors are involved in the stability of the opening, the width of the span is one of the most important. Assuming it is rather small, the overlying rock strata can bridge across the opening with little movement or convergence of the top or bottom. However, as the span increases, a point is reached where the stress in the overlying rock strata exceeds some strength value of the rock and the overlying strata breaks loose and begins to fill the void left by the coal mining (Mining Engineering Handbook, 1973). How far above the mined opening the actual caving occurs depends upon the width and height of the void and the depth and nature of the overburden. Breaking and caving above mine openings are extensive where height-to-width ratios are near one; whereas, the overlying strata may only break one to three mining thicknesses above mine openings with very small height-to-width ratios. Above the caving, the rock strata commonly flex downward into mine openings as more or less continuous units only a few mining heights above mine openings with very small height-to-width ratios. The fragmented debris below is recompressed (Dunrod, 1978).

It has been found that maximum subsidence, expressed as a percentage of the extracted coal seam thickness, is a function of the ratio of the width of the underground excavation to the depth of the excavation (National Coal Board, 1975). This function was the result of observations made by the National Coal Board of a variety of mining conditions in Great Britian. From Figure 1, the ratio of width to depth (W/D) can be used to estimate maximum subsidence for the room and pillar mining previously described.

Because of the range of widths and depths used in the construction of the curve, this method is more accurately applied to areas of deeper overburden. In a case where mining is occuring at a depth of 200 feet, the width-to-depth ration would be 0.1 (20 foot rooms/200 foot overburden depth). Reading the curve from the above graph, for this case, the subsidence would be approximately 10 percent of the extracted coal seam thickness or one foot (0.1 x 10 foot seam). The Mining Engineering Handbook states that as long as the W/D ratio is below 0.25 subsidence and surface damage is negligible. It can be seen that deeper over-

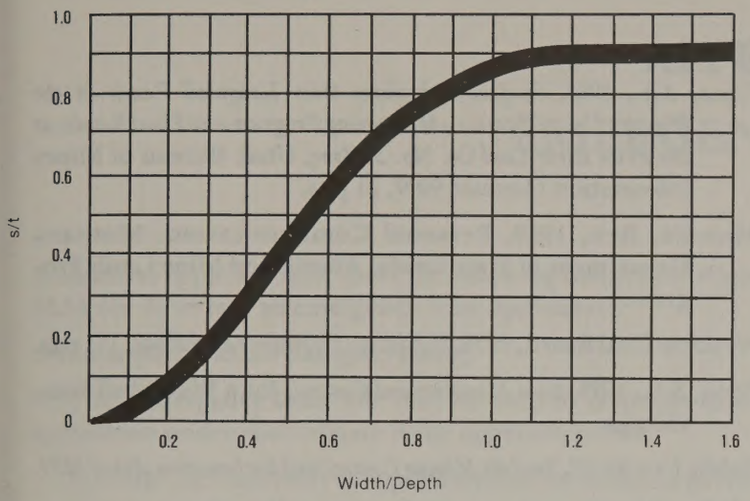

Figure 1 — Subsidence as a function of W/D for full caving

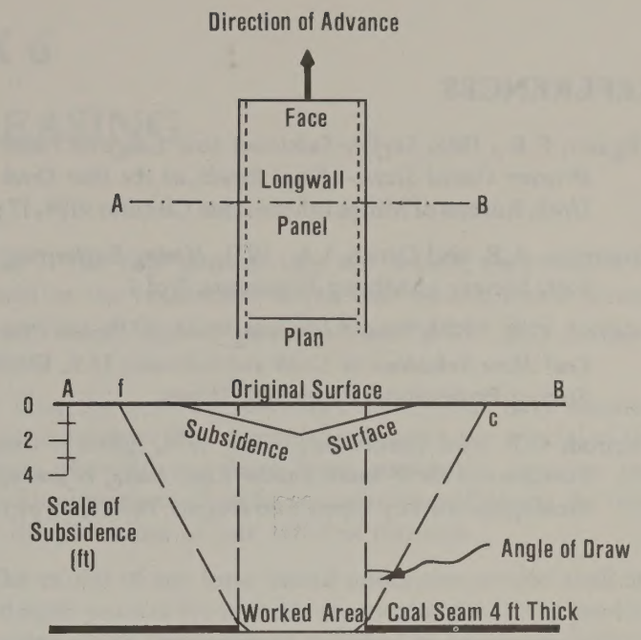

Figure 2 — Subsidence over a longwall face

burden, for example 400 feet, would result in lesser subsidence (20/400 = 0.05 or one-half foot).

There has not been much study of subsidence of room and pillar mines in the west. The U.S. Geological Survey (Dunrod, 1978) undertook a study concerning the effects of underground room and pillar coal mining in the Sheridan, Wyoming and Beulah, North Dakota areas. This study corroborates the mining problems under shallow overburden. But it is difficult to apply any more of the results of that study to the Bull Mountains area because of the variations in geological conditions and overburden material properties. It is more reliable to apply the results of past mining in the Bull Mountains to estimate what subsidence future mining may cause.

Past mining and empirical estimates show that subsidence over most of the proposed room and pillar mining areas in the Bull Mountains will not be a noticeable problem. There is some chance that room and pillar mining under shallow overburden, less than 40 feet, will result in sinkhole subsidence necessitating repair.

The other mining method being analyzed here, is the longwall mining system. Over the past 20+ years of longwall mining in the U.S., there have been several studies completed where the mining conditions are similar enough that the results can be applied to the longwall subsidence question of the Bull Mountains. Recent studies of subsidence over longwall mines in Colorado and Utah are applicable to this area because of similarities in geology. There has never been any longwall mining experience in the Bull Mountains to draw any direct conclusions from.

In contrast to the room and pillar mining previously discussed, subsidence will definitely occur as a result of longwall mining. Given the fact subsidence will occur, the only determination left to make is the extent. Again the decisive factors involved are width of the coal extraction area, the coal thickness, and depth and nature of the overburden.

The surface expression of a single longwall panel is in the form of a broad trough with the maximum lowering of the surface elevations over the center of the panel. The lowering of the surface elevations tapers to zero at a point outside of the boundaries of the panel. Figure 2 is an illustration of this process.

Subsidence will be at its maximum if the width of the excavation is at its "critical" value. For instance the National Coal Board of Great Britian has found the critical width there to be 1.4 times the depth of the seam. A recent Bureau of Mines study in Utah found the critical width to be 1.6 times the depth.

As the minimum dimension of the extraction exceeds the critical width and becomes "supercritical", the subsidence profile assumes a characteristic flat-bottomed shape with more than a single point reaching maximum possible subsidence (Allgaier, 1988). This would be the case when adjacent longwall panels are mined or a single panel mined under lesser overburden. Pillars between adjacent longwall panels can cause humps in the subsidence profile if they are not designed to crush under the weight of the collapsing roof.

Assuming that critical or supercritical excavation widths are achieved, the maximum surface subsidence for a longwall mine in the Bull Mountains may approach 0.70 of the extracted coal thickness. This number is near the high end of the range of values experienced for longwall coal mines in the west. Therefore with a coal thickness of 10 feet, the maximum surface subsidence will be approximately 7 feet (0.70 x 10 feet) over the longwall panels.

CONCLUSIONS

Possible adverse impacts from subsidence which could affect the value and foreseeable land use are slope failure, surface fissures, and altered drainage patterns. Good mining practices, such as crushable pillars and rapid and complete extraction, which reduce surface tensile strain should consequently reduce the possibility of severe surface damages. Prior to the approval of a mining permit, the regulatory authority will determine if subsidence will/could cause material damage or diminution of value or foreseeable use of the land and prescribe measures to mitigate the damage.

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APPENDIX 6

EMERGENCY LEASING

A coal lease applicant must meet the following conditions before BLM can entertain an emergency lease application.

43CFR subpart 3425.1-4 Emergency leasing.

"(a) An emergency lease sale may be held in response to an application under this subpart if the applicant shows:

(1) That the coal reserves applied for shall be mined as part of a mining operation that is producing coal on the date of the application, and either:

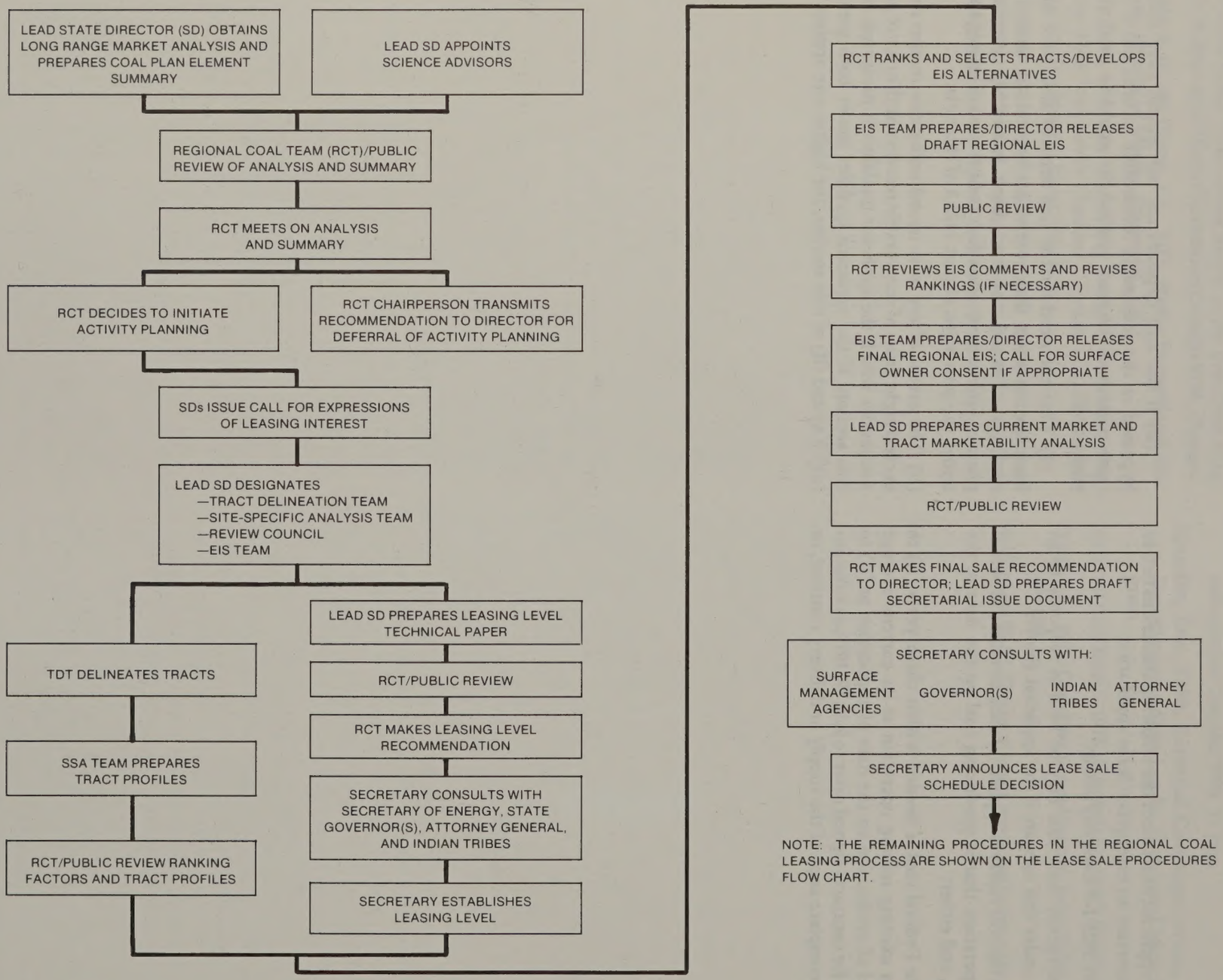
(i) The Federal coal is needed within three years (A) to maintain an existing mining operation at its current average annual level of production on the date of application or (B) to supply coal for contracts signed prior to July 19, 1979, as substantiated by a complete copy of the supply or delivery contract, or both; or

(ii) If the coal deposits are not leased, they would be bypassed in the reasonable foreseeable future, and if leased, some portion of the tract applied for would be used within 3 years; and

(2) That the need for the coal deposits shall have resulted from circumstances that were either beyond the control of the applicant of could not have been reasonably foreseen and planned for in time to allow for consideration of leasing the tract under the provisions of part 3420.3 of this title.

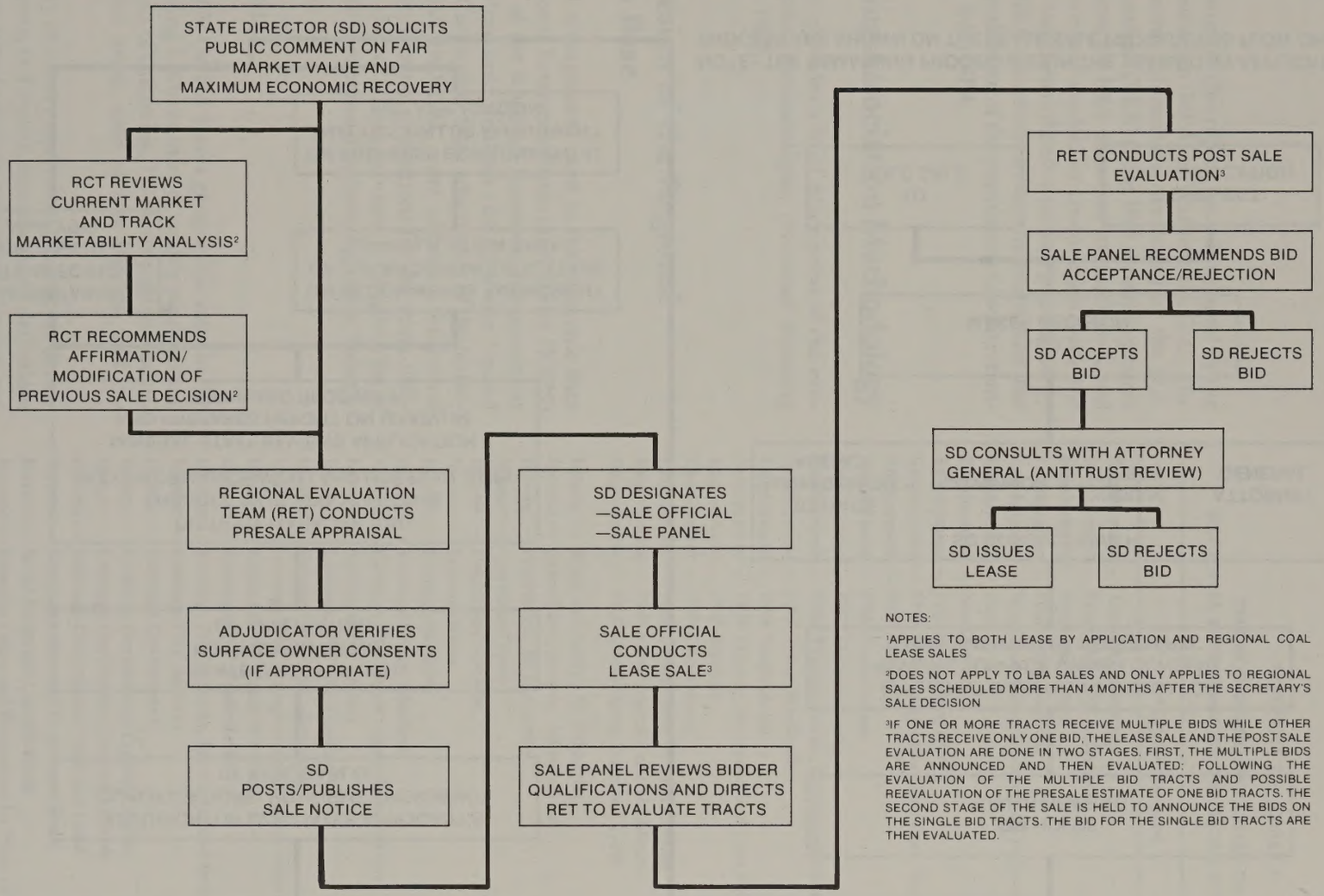
(b) The extent of any lease issued under this section shall not exceed eight years of recoverable reserves at the rate of production under which the applicant qualified in paragraph (a)(1) of this section. If the applicant qualifies under both paragraphs (a)(1)(A) and (B) of this section, the higher rate applies."

REGIONAL COAL ACTIVITY PLANNING FLOW CHART



NOTE: THE REMAINING PROCEDURES IN THE REGIONAL COAL LEASING PROCESS ARE SHOWN ON THE LEASE SALE PROCEDURES FLOW CHART.

COAL LEASE SALE PROCEDURES FLOW CHART[1]



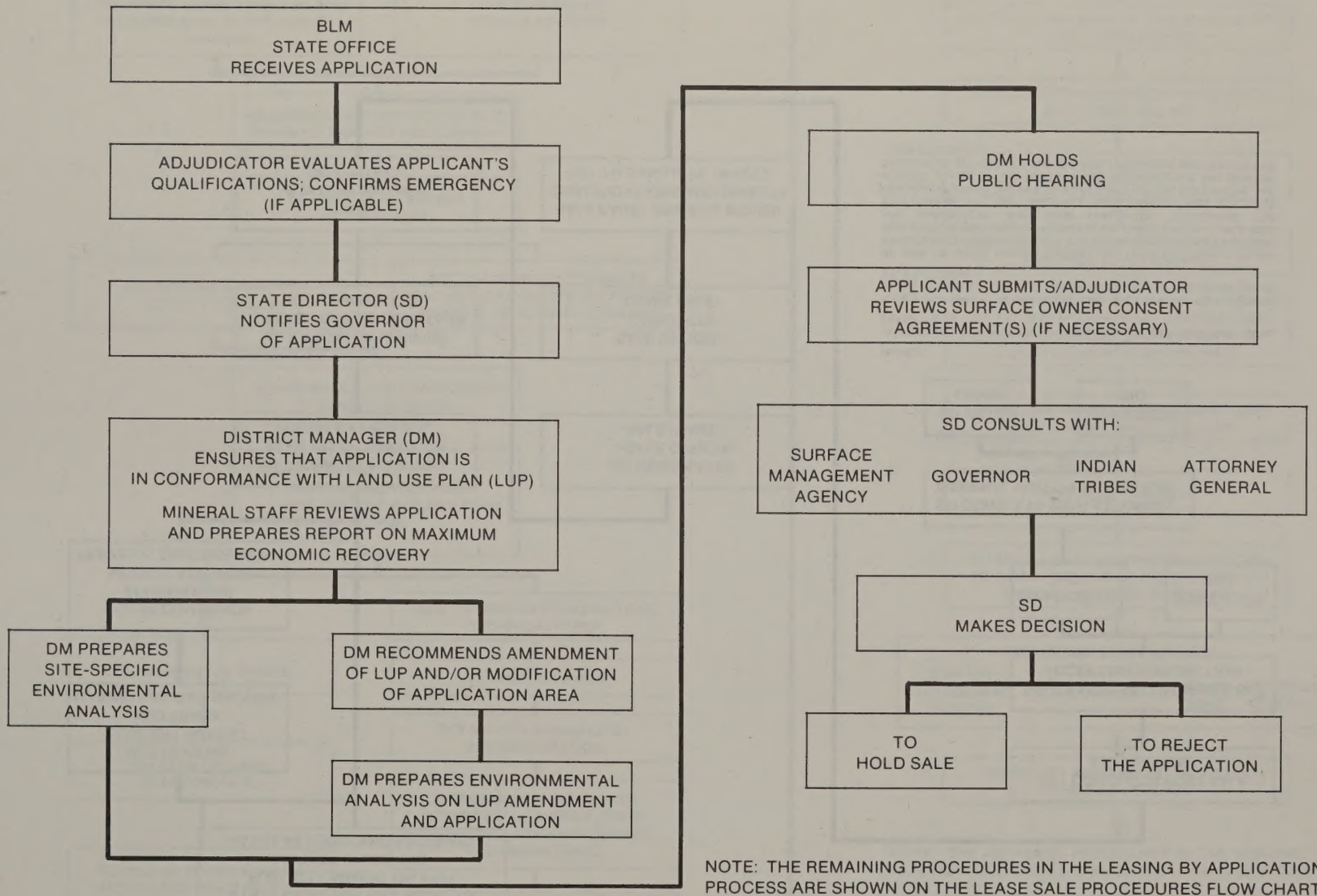
NOTES:

[1]APPLIES TO BOTH LEASE BY APPLICATION AND REGIONAL COAL LEASE SALES

[2]DOES NOT APPLY TO LBA SALES AND ONLY APPLIES TO REGIONAL SALES SCHEDULED MORE THAN 4 MONTHS AFTER THE SECRETARY'S SALE DECISION

[3]IF ONE OR MORE TRACTS RECEIVE MULTIPLE BIDS WHILE OTHER TRACTS RECEIVE ONLY ONE BID, THE LEASE SALE AND THE POST SALE EVALUATION ARE DONE IN TWO STAGES. FIRST, THE MULTIPLE BIDS ARE ANNOUNCED AND THEN EVALUATED; FOLLOWING THE EVALUATION OF THE MULTIPLE BID TRACTS AND POSSIBLE REEVALUATION OF THE PRESALE ESTIMATE OF ONE BID TRACTS. THE SECOND STAGE OF THE SALE IS HELD TO ANNOUNCE THE BIDS ON THE SINGLE BID TRACTS. THE BID FOR THE SINGLE BID TRACTS ARE THEN EVALUATED.

COAL LEASING BY APPLICATION FLOW CHART



NOTE: THE REMAINING PROCEDURES IN THE LEASING BY APPLICATION PROCESS ARE SHOWN ON THE LEASE SALE PROCEDURES FLOW CHART.

APPENDIX 7

METHODOLOGY FOR ECONOMIC AND DEMOGRAPHIC PROJECTIONS

Foreword

The projections presented in this report were developed by the National Planning Association (NPA) in Washington, D.C. The NPA model uses economic information developed by the U.S. Bureau of Economic Analysis (BEA) (June 1988 series) to project income and employment by BEA economic areas, States, and Counties. A cohort-survival model, in conjunction with the economic projections, was then utilized to project population by age and sex for the BEA economic areas, the State, and the Counties. A further breakdown of the population to white/non-white also is available from NPA.

National Planning Association Methodology

The following excerpt provides a brief description of the economic and demographic methodologies (National Planning Association, February 1989).

Content and Design of the Regional Economic Data Base

The data content and arrangement used in the economic data base of the 1987 Regional Economic Projections Series (REPS) follows the data base of the Regional Economic Measurement Division, Bureau of Economic Analysis (BEA) of the United States Department of Commerce, from which most of the historical data for the period 1967-1984, were obtained. Historical estimates for 1985-87 and annual projections for the years 1988-2010 were prepared by the NPA Data Services. A complete list of the variables in the REPS economic data base is given in Table 1.

Geographic Units

There are a total of 3,657 United States geographic areas in the REPS data base, including 3,096 counties or county equivalents, 50 states and the District of Columbia, 317 metropolitan statistical areas, 183 economic areas, nine census regions, and the United States totals.

Where possible, county or county equivalent geographic definitions were used. However, in Virginia, special county definitions were necessary for some areas to include independent cities, and in five other states county combinations were required involving in most cases recently created counties for which sufficient historical data is not available to permit separate projections.

The REPS(tm) data base includes 317 metropolitan statistical areas (MSAs) reflecting the 1986 Office of Management and

APPENDIX 7 — TABLE 1

THE ECONOMIC DATA BASE OF THE REGIONAL ECONOMIC PROJECTIONS SERIES, REPS(tm)

Variable Description
Employment — Total, All Industries
Employment — Proprietors, All Industries
Employment — Proprietors Farm
Employment — Proprietors Nonfarm
Employment — Wage and Salary Workers, All Industries
Employment — Farm
Employment — Nonfarm
Employment — Private Nonfarm (PNF)
Employment — PNF Other (Agricultural services, Forestry, Fisheries)
Employment — PNF Mining
Employment — PNF Construction
Employment — PNF Manufacturing
Employment — PNF Transportation, Communications, and Public Utilities
Employment — PNF Trade Wholesale
Employment — PNF Trade Retail
Employment — PNF Finance, Insurance, and Real Estate
Employment — PNF Services
Employment — PNF Government
Employment — PNF Government Federal Civilian
Employment — PNF Government Federal Military
Employment — PNF Government State and Local
Income — Wage and Salary, All Industries
Income — Other Labor Income, All Industries
Income — Proprietors, All Industries
Income — Proprietors Farm
Income — Proprietors Nonfarm
Income — Earnings Farm
Income — Earnings Nonfarm
Income — Earnings Private Nonfarm
Income — Earnings PNF Other (Agricultural services, Forestry, Fisheries)
Income — Earnings PNF Mining
Income — Earnings PNF Construction
Income — Earnings PNF Manufacturing
Income — Earnings PNF Transportation, Communications, and Public Utilities
Income — Earnings PNF Trade Wholesale
Income — Earnings PNF Trade Retail
Income — Earnings PNF Finance, Insurance, and Real Estate
Income — Earnings PNF Services
Income — Earnings Government
Income — Earnings Government Federal Civilian
Income — Earnings Government Federal Military
Income — Earnings Government State and Local
Income — Earnings Labor and Proprietors Total
Income — Social Insurance Contributions
Income — Earnings Labor and Proprietors by Place of Work
Income — Residence Adjustment
Income — Earnings Labor and Proprietors by Place of Residence
Income — Dividends, Interest, and Rent
Income — Income — Transfers

Budget definitions. This data base also includes 183 economic areas defined in 1977 by the BEA. There are a total of 8.4 million data points in the REPS regional economic data base.

Population

Total population in the regional data base includes the results of the 1980 Census of Population and mid-year estimates for July 1 made by the U.S. Bureau of the Census for subsequent years through 1986 by county and through 1987 by State. The intercensus years (1971 to 1979) have been reestimated by the Census Bureau for consistency with the 1970 and 1980 Census results. The population data for the census years 1970 and 1980 has been rebased forward from the April count to July. Hence, the population figures in the REPS data base for these years differ from the many published Census results by the amounts of population change between April and July. Population data is expressed in thousands of persons.

Employment

The employment concept used in the REPS economic data base is job counts, measured in thousands of proprietors and wage and salary workers. For wage and salary workers the number of full-time and part-time employees are used with no attempt to convert to full-time equivalents. Accordingly, a person with more than one job would be counted more than once. This employment series is greater than employment measured by the number of persons employed. Also, because of differences in coverage, in particular of the military, employees of households, students employed by State universities and elected State and local government officials, the BEA employment totals for nonagricultural wage and salary workers differ from, and generally are larger, than the corresponding Bureau of Labor Statistics data.

For the second year now the number of proprietors reflects the changed definitions adapted by the BEA in 1986. These definitions are based on the number of sole proprietors and partners (excluding limited partnerships) as determined from the income tax records. The new concept yields a considerable higher estimate of the number of proprietors than the previously used survey based data which counted only proprietors whose primary occupations was the conduct of their unincorporated businesses. In the present data set the secondary self-employment jobs are treated symmetrically with the secondary wage and salary jobs, and the data for proprietors income and for the number of proprietors are derived from the same sources.

The national employment series is residence based. Thus, United States citizens employed outside the country are not included. However, the regional employment series used here is based on place of work and not on place of residence; thus, a commuter living outside of the center city county but working there would be counted as employed in the center city county.

The county data obtained from the BEA contains cells in private nonfarm wage and salary sectors that were withheld because of Federal information disclosure policies. To estimate the missing data for specific areas in an industry, the data for omitted years was interpolated from existing yearly data. If all years, or most years, for given areas in an industry were withheld, State distributions or distributions within the County were used to estimate the missing area values. For example, if most of the yearly data for mining employment in a given County was withheld, the share of mining employment relative to total employment in the county for the reported years of mining employment would be used to estimate the missing years. If all the years were missing for mining employment in a given county then the available data for share of total county employment relative to State employment was used as the starting point to estimate the missing county data.

The interpolated cells were then constrained to County employment totals and aggregated to economic area and State totals. The constraining procedure is noniterative with respect to the State totals. Thus, the State data for series with missing data change with aggregation.

Earnings

Earnings of one-digit SIC industries are the sum of wage and salary income, other labor income, and of proprietor's income as defined by the NIPA. The earnings figures are in thousands of 1982 dollars deflated by the personal consumption expenditure deflator. As with the employment series, earnings are residence based nationally so that United States citizens employed outside of the country are not included; and again, regionally, the earnings series are reported by place of work and not of residence.

Personal Income

Personal income by type of income is also defined as in the National Income and Product Accounts (NIPA). The first four components (wages and salaries, other labor income, farm, and nonfarm proprietor's income) sum to earnings. Dividends, interest, and rental income of persons are the sum of the corresponding three NIPA accounts. Transfer payments to persons are also included in personal income. However, personal contributions to social insurance are subtracted from the sum of the other parts of personal income in calculating personal income.

Residence adjustment is the net amount of personal income earned in a geographic area that is earned by people not residing in the area. Thus, a negative residence adjustment implies that workers commute into an area to earn income but do not reside there; similarly, a positive residence adjustment implies that on the balance the area "exports" labor.

For County income data containing cells for private nonfarm earnings which were withheld because of Federal information disclosure policies, the procedures used to estimate these cells were the same as those used to estimate missing employment values. Personal income, and its components are in thousands of 1982 dollars as deflated by the personal consumption expenditure deflator.

Economic Growth Assumptions

The U.S. economic growth assumptions underlying the 1987 Regional Economic Projections Series are basically those contained in the National Economic Projections Series (1986, Vols. 2 and 3), which project an economy characterized by rising labor force participation rates but also by a long-term slowing down in the rate of growth in population and labor force, relatively high rates of capital formation and moderately high growth in productivity and hourly earnings. This projection was further modified somewhat to reflect the data that were available for 1987 in October 1987.

The main economic variable in the Regional Economic Projections Series is real personal income. Movements in the real personal income closely parallel changes in GNP. The personal income series used in REPS is consistent with the personal income total for the United States in the BEA county level regional data tape. However, because of the difference in the residence concept and in the deflation procedure this series differs somewhat from some of the published United States total series for personal income.

Methods of Projection

The basic method used to generate the REPS economic projection can be described as a "regional growth accounting model" which disaggregates a national forecast into consistent subnational forecasts. The national forecasts of total population, employment by industry, earnings by industry, and personal income are generated by the economic growth model of the United States (see National Economic Projections Series, 86-N-1, 86-N-2, 860-N-3).

The national projections are first allocated to the Economic Areas and then to counties within these areas through a two-step disaggregation process utilizing relative growth rate differential and multiplier analyses. The county estimates are then aggregated into State, Regional, and Metropolitan Statistical Area totals.

The economic area forecast begins by projecting employment in each industry for each area based on area historical growth rate differentials. The base period between the average of 1969, 1971, and 1973 and the average of 1984 to 1986 values of the individual employment series is used to calculate the difference between the national growth rate and the area growth rate for each of the employment sectors. Military employment is assumed to remain constant at the base period level for the entire projection period.

The calculated area growth rate differentials for each industry are assumed to decay over the projection horizon. A decay series of X^t, $0<X<1.0$, (where X is industry specific and is derived from historical experience and t takes the values 1 through 23 for the projection years 1988 to 2010) was applied to each area's observed historical differential yielding an initial estimate of area projected growth rate differentials. Adding these values to the projected national growth rates, multiplying by prior year employment, and constraining the area values to national controls yielded the final estimates of projected area employment.

The next stage in the projection process is population, which is assumed to follow total employment opportunities. The area specific ratios to population in the base period reflect the long-term structural differences among areas in age composition of population, in employment rates, in labor force participation, and in interarea commute flows. The projected employment-population ratios of the individual economic areas are constrained to move in proportion to changes in the employment population ratio projected for the United States.

Finally, personal income projections are developed by using a series of multiplier calculations. For each sector, earnings per job multiplier changes are calculated for the historical periods as above. The national/area differentials are assumed to decay over the projection horizon, and the area earnings estimates are constrained to sum the national controls, yielding total labor and proprietor's earnings by area.

Estimates of total wages and salaries, other labor income, and contributions to social insurance are projected using a per job multiplier calculation. The non-earnings components of personal income (transfers and dividends, interest and rent) are projected using a per capita multiplier. Summing earnings by sector, subtracting personal contributions to social insurance, and adding the residence adjustment, transfers, and property income (dividends, interest, and rent) yielded per capital income.

County Projections

In general, the projection methods developed for the Economic Area projections are also used for county level projections. In this case, however, economic areas act as the control areas, and the growth rate and multiplier differentials are calculated relative to the economic area growth rates.

Population is treated differently at the county level. In this case, growth rate differentials are used instead of multipliers. Thus, county level population shares are not directly related to employment changes since intra-area commutation is common, and the residential patterns follow their own trends.

Demographic Projection Techniques

The following excerpt provides a brief description of the demographic projection techniques (National Planning Association, February 1989).

Population

The 1988 REPS demographic projection was based on a projection of closed population at the economic area and at the county level of geographic detail and on corresponding migration analyses. The closed population was projected by the cohort component method which used regional age and race specific birth rates and age, sex, and race specific survival rates to project the natural increase (excluding migration) of population of each

area. Total net migration was given as the difference between this "closed" population and an externally derived estimate of total "open" population obtained from the REPS economic model. Distribution of the total net migration by age, sex, and race yields the final estimates of projected "open" population by age, sex, and race.

The estimating process was first applied at the Economic Area level, with the projected U.S. estimates acting as control values. The 1988 REPS demographic projections begin with the actual detailed (by age, sex and race) county population data for 1980, 1982, 1984, and 1986, from the Bureau of the Census and its interpolation for the intervening years. Population for the census years was shifted to July 1 base. Data for 1987 and 1988 was adjusted to match the reported state totals.

For each area, a matrix of five-year birth rates by age and race of mother is multiplied by the female cohort estimates in the childbearing age groups, yielding total five-year birth rates by age and race for the area. Multiplying these estimates by a sex ratio yields births by sex and race.

Next, the population in each five-year cohort is multiplied by age, sex, and race specific five-year survival rates. This yields estimates of the "closed" population. Subtracting total closed population figures from the total "open" population estimates obtained from the REPS economic model yields an estimate of total implicit net migration for each area.

The 1975-80 Census migration data by age, race, and sex for each area are then used to distribute the total net migration by these groups. The migration rates are adjusted to smooth out the sampling fluctuations, to reflect specific local population characteristics, such as military population, and also for consistency with the observed changes in the distribution of population between 1980 and 1985, given birth and survival rates.

This process was applied to 1985, 1990, 1995, 2000, and 2005 yielding estimates for 1990, 1995, 2000, 2005, and 2010 estimates. Data for the years 1986 to 88 was also consistent with the already available Census estimates, including full county detail for 1986. Finally, data for the intervening years (1989, 1991 to 1994, 1996 to 1999, 2001 to 2004, 2006 to 2009) were calculated by interpolation between the 1985, 1990, 1995, 2000, 2005, and 2010 values. Data for the years 1986 to 1988 was also made consistent with the available census estimates.

The entire estimating process was then repeated at the county level of detail with the projected Economic Area estimates acting as control values for the county projections in the respective Economic Areas. The county data for 1986 were given by the Census estimates and the data for 1987 to 1988 were adjusted to conform with the demographic information available for the states.

Households

The number of households by county was estimated for 1985 by Dr. George S. Masnick of the Joint Center for Housing Studies of Harvard University and Massachusetts Institute of Technology using the Bureau of the Census county and state data for 1970 and 1980, the state data for 1985, and the NPA Data Services county demographic data for 1980 and 1985. These estimates were extended by the NPA Data Services, Inc. using essentially the same approach and the available state totals for 1986 to 1988, interpolated for the years 1981 to 1984 and 1971 to 1979, extrapolated back for 1967 to 1969 and projected for 1989 and subsequent years to 2010.

Adjustments to Projections

The NPA services sector employment and income data for Musselshell County were both adjusted downward. The original employment data for the services sector in Musselshell County was projected to increase to 700 persons by the year 2010. Since the other sectors in the Musselshell County economy were showing little or no growth and the services sector to the remainder of employment ratio was growing faster than the state ratio, the services sector employment sector in Musselshell County was constrained to slightly less than the state services sector employment to remainder of employment ratio. The State ratio in 2010 was 0.48 (services sector to remainder of employment) and the original Musselshell County ratio was 0.51 in 2010. The Musselshell ratio used to constrain this growth rate was 0.45 (620 jobs/1,370 jobs) in 2010. Thus, the services sector employment was allowed to increase from 470 employees in 1990 (services to remainder ratio = 0.33) to 620 employees in 2010 (services to remainder ratio = 0.45).

Services sector earnings were also constrained. First, earnings per employee was calculated and the new employment figures derived from the services sector adjustment were used to project new services sector earnings. A further constraint was placed on earnings in the services sector in that earnings were not allowed to increase at a faster rate than the earnings per employee for the remaining industry groups.

Information Sources

National Planning Association Data Services, Inc., Washington, D.C. February 1989. Unpublished data.

U.S. Department of Commerce, Bureau of Economic Analysis. June 1988 data series.

APPENDIX 8

QUALITY OF LIFE SURVEYS

Interviews were conducted with residents within the Musselshell County study area concerning their perceptions of the quality of life in their area. The sample was stratified based on the geographic location of the respondent's residence; those persons who reside in the Bull Mountains within five miles of the PM Coal Mine were considered "Bull Mountains" respondents and those persons who reside in the Roundup three-digit prefix exchange and not within five miles of the PM Coal Mine were considered "Roundup area" respondents.

The primary purpose of the quality of life survey was to investigate and identify attitudes of Roundup area residents toward the potential land exchange and subsequent mine development. The following discussion on error rates of proportional estimates relates only to the Roundup area survey.

For the Roundup area respondents, a random sample size of 99 was selected using the current telephone directory for Roundup. The universe for the survey was the estimated 1,300 households in the Roundup area listed in the Roundup telephone directory. For proportional estimates in the survey, a 95 percent confidence interval would be estimated by:

$$Pr \pm .095 \qquad \text{(Normal approximation)}$$

This implies that 95 percent of the time the true population proportion would fall within the interval $Pr \pm .095$.

Sources utilized to obtain telephone numbers of Bull Mountains residents within five miles of the PM Coal Mine that were included in the survey were the local telephone directory, Musselshell County Clerk and Recorder office, and Bull Mountains informants. Forty-one people were interviewed from the Bull Mountains area.

The survey instrument consisted of 40 questions utilizing both open-ended and close-ended questions (i.e., those in which answer categories are provided). Telephone interviews were conducted between February 17 and 28, 1989, and on March 2, 1989. Calls were made during day and evening hours, seven days a week to ensure that each potential respondent had an opportunity to participate in the survey.

An item-by-item tabulation of close-ended questions (i.e., frequency distributions) is presented in the following section for both the Bull Mountains informants and Roundup area informants. Percents do not include responses not within the defined answer categories (e.g., don't knows).

QUALITY OF LIFE SURVEY
(BULL MOUNTAINS AREA RESIDENTS)

Q-1 Do you live within 10 miles of the PM Coal Mine off the Old Divide Road?

1) YES -- Approximately how many miles do you live from the mine?

2) NO _____ MILES

Q-2 I am going to read a list of services which are available in most towns and I would like you to rate the services presently available in your area. Using the ratings of above average, average, or below average, how would you rate:

	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE
1) POLICE PROTECTION	7.5%	75.0% n = 40	17.5%
2) STREETS/HIGHWAYS	12.2%	51.2% n = 41	36.6%
3) FIRE PROTECTION	50.0%	22.5% n = 40	27.5%
4) TELEPHONE SERVICE	53.7%	46.3% n = 41	0.0%
5) HOSPITALS	40.0%	37.1% n = 35	22.9%
6) WATER SUPPLY	0.0%	40.9% n = 22	59.1%
7) SEWER SYSTEM	16.7%	83.3% n = 6	0.0%
8) SOCIAL SERVICES	6.4%	83.9% n = 31	9.7%
9) SCHOOL SYSTEM	51.3%	41.0% n = 39	7.7%
10) COUNTY GOVERNMENT	2.5%	65.0% n = 40	32.5%
11) CITY GOVERNMENT	0.0%	88.9% n = 18	11.1%
12) HOUSING	2.8%	72.2% n = 36	25.0%

Q-3 In what city do you shop most often for articles such as clothing, small appliances, or kitchenware?

1) BILLINGS	82.9%
2) ROUNDUP	17.1%
3) OTHER	

n = 41

Q-4 In what city do you most often shop for major purchases such as cars, furniture, or appliances?

1)	BILLINGS	72.5%
2)	ROUNDUP	27.5%
3)	OTHER	
		n = 40

Q-5 When you shop in Roundup, what do you consider to be the best feature?

1)	SELECTION OF GOODS AND SERVICES	0.0%
2)	STORE HOURS	2.9%
3)	CREDIT AVAILABILITY	2.9%
4)	CLOSE TO PLACE OF RESIDENCE, OR	91.4%
5)	LOW PRICES	2.9%
		n = 35

Q-6 What do you consider to be the worst feature?

1)	SELECTION OF GOODS AND SERVICES	46.0%
2)	STORE HOURS	5.4%
3)	CREDIT AVAILABILITY	2.7%
4)	HIGH PRICES	46.0%
		n = 37

Q-7 What do you like MOST about the area in which you live?

Q-8 What do you like LEAST about the area?

Q-9 Would you say the local residents have an opportunity to participate in the decision-making process of the county government?

1)	YES	65.9%
2)	NO -- Why not?	34.1%
		n = 41

Q-10 Do you feel your comments or suggestions are considered:

1)	ALL THE TIME	5.0%
2)	MOST OF THE TIME	30.0%
3)	SOMETIMES	37.5%
4)	VERY LITTLE, OR	17.5%
5)	NEVER	10.0%
		n = 40

Q-11 How often do you participate in government activities? Would you say:

1)	ALWAYS	12.5%
2)	MOST OF THE TIME	20.0%
3)	SOMETIMES	27.5%
4)	VERY LITTLE, OR	37.5%
5)	NEVER	2.5%
		n = 40

Q-12 Which ONE of the following groups do you think has the most power in deciding about the future of the area?

1)	COUNTY COMMISSIONERS	42.5%
2)	SMALL BUSINESSES	2.5%
3)	LARGE CORPORATIONS	22.5%
4)	GENERAL PUBLIC	12.5%
5)	ENVIRONMENTAL GROUPS	17.5%
6)	OTHER:	2.5%
		n = 40

Q-13 a) Would you describe the local economy as:

1)	GROWING	2.4%
2)	STABLE, OR	4.9%
3)	DEPRESSED	92.7%
		n = 41

b) Why do you think it is _____?

Q-14 Do you think young people have an opportunity to work at an occupation in the area?

1)	YES	12.2%
2)	NO -- Why not?	87.8%
		n = 41

Q-15 a) What do you see as social problems in your area? (HINT: Alcoholism, crime, teenage pregnancy) If NONE, Skip to Q-16!

b) How is the community responding to these problems?

Q-16 In your opinion, are there different social classes of people in Roundup?

1) YES	70.0%
2) NO	30.0%
	n = 40

Q-17 Which groups or individuals have the most economic and political power in Roundup?

Q-18 Do you think it is easy, about average, or difficult to get to know people in your area?

1) EASY	58.5%
2) ABOUT AVERAGE, OR	31.7%
3) DIFFICULT	9.8%
	n = 41

I am going to read you a short list of statements and I would like you to tell me whether you agree or disagree with each of them.

	AGREE	DISAGREE
Q-19 People in the area are proud of their mining heritage.	94.9%	5.1%
	n = 39	
Q-20 Families in the area spend a lot of time together after working hours.	80.6%	19.4%
	n = 36	
Q-21 Groups or organizations from outside the Roundup area have a great influence on the area.	42.5%	57.5%
	n = 40	
Q-22 It is difficult to organize help for families who have suffered hardships.	5.3%	94.7%
	n = 38	
Q-23 Church activities are important to most of the people in Roundup.	91.4%	8.6%
	n = 35	

Q-24 Do you think there is a lot of community-oriented activities in Roundup?

1) YES -- What are they?	82.1%
2) NO	17.9%
	n = 39

Q-25 Do you or your spouse belong to an organized civic or recreational group?

1) YES -- Which ones?	46.3%
2) NO	53.7%
	n = 41

Q-26 Do members of your household engage in outdoor recreational activities?

1) YES	85.4%
2) NO	14.6%
	n = 41

Q-27 Do you have any concerns about the land exchange ITSELF, <u>not</u> including the proposed mine?

1) YES -- What are those concerns?	41.0%
2) NO	59.0%
	n = 39

Q-28 What are the most important <u>positive</u> effects that the mine would have on the area?

Q-29 What are the most important <u>negative</u> effects that the mine would have on the area?

Q-30 Which <u>ONE</u> of the following statements best describes how you feel about newcomers moving into your area?

1) I WOULD WELCOME THEM	75.0%
2) I PROBABLY WOULDN'T NOTICE THEM, <u>OR</u>	17.5%
3) I WOULD PREFER NOT TO HAVE THEM MOVE IN	7.5%
	n = 40

Q-31 Do you think it would be easy for newcomers to become an active member in the community?

1)	YES	92.7%
2)	NO -- Why not?	7.3%
		n = 41

Q-32 If up to 25 new families were to move into the Roundup area, do you think they would have a positive, harmful, or no effect on the following services?

		POSITIVE	HARMFUL	NO EFFECT
1)	POLICE PROTECTION	20.0%	12.5%	67.5%
			n = 40	
2)	STREETS AND HIGHWAYS	17.1%	12.2%	70.7%
			n = 41	
3)	FIRE PROTECTION	30.0%	10.0%	60.0%
			n = 40	
4)	HOSPITALS	73.7%	2.6%	23.7%
			n = 38	
5)	PUBLIC WATER SUPPLY	7.7%	28.2%	64.1%
			n = 39	
6)	SEWER SYSTEM	15.0%	0.0%	85.0%
			n = 20	
7)	SOCIAL SERVICES	36.4%	12.1%	51.5%
			n = 33	
8)	SCHOOL SYSTEM	73.2%	9.8%	17.0%
			n = 41	
9)	COUNTY GOVERNMENT	50.0%	2.5%	47.5%
			n = 40	
10)	CITY GOVERNMENT	29.1%	4.2%	66.7%
			n = 24	
11)	ORGANIZED RECREATION	69.2%	0.0%	30.8%
			n = 39	
12)	SHOPPING FACILITIES	68.3%	2.4%	29.3%
			n = 41	
13)	COMMUNITY ORGANIZATIONS	67.6%	2.7%	29.7%
			n = 37	
14)	PRICE OF HOUSING	64.9%	5.4%	29.7%
			n = 37	

Q-33 Would the increased opportunity for more jobs created by the mine be important to you?

1)	YES	68.3%
2)	NO	31.7%
		n = 41

Q-34 Would you be willing to work at the mine if you were in need of a job?

1) YES	70.7%
2) NO — Why not?	29.3%
	n = 41

Q-35 What, if any, are your concerns about the mine operating in the Bull Mountains?

Q-36 Do you consider the largest proportion of the people residing in the area to be long-time residents of the area?

1) YES	47.5%
2) NO	52.5%
	n = 40

Q-37 How long have you lived there?

_____

If LIFETIME - Skip to Q-39

Q-38 Why did you move there?

Q-39 Do you own or rent your home?

1) OWN	92.7%
2) RENT	7.3%
	n = 41

Q-40 Are you satisfied with your home location and the condition as it is today?

1) YES	90.2%
2) NO — WHY NOT?	9.8%
	n = 41

SEX OF RESPONDENT:

MALE	58.5%
FEMALE	41.5%
	n = 41

Is there anything else that you would like to add about the land exchange or the proposed mine?

QUALITY OF LIFE SURVEY
(ROUNDUP AREA RESIDENTS)

Q-1 Do you live within 10 miles of the PM Coal Mine off the Old Divide Road?

1) YES -- Approximately how many miles do you live from the mine?

_____ MILES

2) NO

Q-2 I am going to read a list of services which are available in most towns and I would like you to rate the services presently available in your area. Using the ratings of above average, average, or below average, how would you rate:

	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE
1) POLICE PROTECTION	18.4%	69.4% n = 98	12.2%
2) STREETS/HIGHWAYS	12.1%	52.5% n = 99	35.4%
3) FIRE PROTECTION	75.3%	20.6% n = 97	4.1%
4) TELEPHONE SERVICE	58.6%	38.4% n = 99	3.0%
5) HOSPITALS	48.4%	43.2% n = 95	8.4%
6) WATER SUPPLY	26.3%	48.7% n = 76	25.0%
7) SEWER SYSTEM	25.5%	72.7% n = 55	1.8%
8) SOCIAL SERVICES	20.6%	68.5% n = 92	10.9%
9) SCHOOL SYSTEM	52.1%	43.6% n = 94	4.3%
10) COUNTY GOVERNMENT	9.5%	64.2% n = 95	26.3%
11) CITY GOVERNMENT	16.4%	67.1% n = 73	16.5%
12) HOUSING	11.3%	75.3% n = 97	13.4%

Q-3 In what city do you shop most often for articles such as clothing, small appliances, or kitchenware?

1) BILLINGS	74.8%
2) ROUNDUP	22.2%
3) OTHER	

n = 99

Q-4 In what city do you most often shop for major purchases such as cars, furniture, or appliances?

1) BILLINGS	60.6%
2) ROUNDUP	39.4%
3) OTHER	
	n = 99

Q-5 When you shop in Roundup, what do you consider to be the best feature?

1) SELECTION OF GOODS AND SERVICES	8.7%
2) STORE HOURS	3.3%
3) CREDIT AVAILABILITY	7.6%
4) CLOSE TO PLACE OF RESIDENCE, OR	77.2%
5) LOW PRICES	3.2%
	n = 92

Q-6 What do you consider to be the worst feature?

1) SELECTION OF GOODS AND SERVICES	68.5%
2) STORE HOURS	3.2%
3) CREDIT AVAILABILITY	1.1%
4) HIGH PRICES	27.2%
	n = 92

Q-7 What do you like MOST about the area in which you live?

Q-8 What do you like LEAST about the area?

Q-9 Would you say the local residents have an opportunity to participate in the decision-making process of the county government?

1) YES	73.2%
2) NO -- Why not?	26.8%
	n = 97

Q-10 Do you feel your comments or suggestions are considered:

1) ALL THE TIME	5.2%
2) MOST OF THE TIME	28.1%
3) SOMETIMES	40.6%
4) VERY LITTLE, OR	22.9%
5) NEVER	3.2%
	n = 96

Q-11 How often do you participate in government activities? Would you say:

1)	ALWAYS	3.0%
2)	MOST OF THE TIME	19.2%
3)	SOMETIMES	33.3%
4)	VERY LITTLE, OR	31.3%
5)	NEVER	13.2%
		n = 99

Q-12 Which ONE of the following groups do you think has the most power in deciding about the future of the area?

1)	COUNTY COMMISSIONERS	58.8%
2)	SMALL BUSINESSES	10.3%
3)	LARGE CORPORATIONS	4.1%
4)	GENERAL PUBLIC	17.5%
5)	ENVIRONMENTAL GROUPS	7.2%
6)	OTHER:	2.1%
		n = 97

Q-13 a) Would you describe the local economy as:

1)	GROWING	2.0%
2)	STABLE, OR	15.2%
3)	DEPRESSED	82.8%
		n = 99

b) Why do you think it is _____?

Q-14 Do you think young people have an opportunity to work at an occupation in the area?

1)	YES	11.2%
2)	NO -- Why not?	88.8%
		n = 98

Q-15 a) What do you see as social problems in your area? (HINT: Alcoholism, crime, teenage pregnancy) If NONE, Skip to Q-16!

b) How is the community responding to these problems?

Q-16 In your opinion, are there different social classes of people in Roundup?

1) YES	62.6%
2) NO	37.4%
	n = 99

Q-17 Which groups or individuals have the most economic and political power in Roundup?

Q-18 Do you think it is easy, about average, or difficult to get to know people in your area?

1) EASY	64.6%
2) ABOUT AVERAGE, OR	28.3%
3) DIFFICULT	7.1%
	n = 99

I am going to read you a short list of statements and I would like you to tell me whether you agree or disagree with each of them.

	AGREE	DISAGREE
Q-19 People in the area are proud of their mining heritage.	98.0%	2.0%
	n = 99	
Q-20 Families in the area spend a lot of time together after working hours.	62.9%	37.1%
	n = 89	
Q-21 Groups or organizations from outside the Roundup area have a great influence on the area.	36.0%	64.0%
	n = 89	
Q-22 It is difficult to organize help for families who have suffered hardships.	8.1%	91.9%
	n = 99	
Q-23 Church activities are important to most of the people in Roundup.	91.7%	8.3%
	n = 96	

Q-24 Do you think there is a lot of community-oriented activities in Roundup?

1) YES -- What are they?	84.5%
2) NO	15.5%
	n = 97

Q-25 Do you or your spouse belong to an organized civic or recreational group?

1) YES -- Which ones?	34.3%
2) NO	65.7%
	n = 99

Q-26 Do members of your household engage in outdoor recreational activities?

1) YES	66.7%
2) NO	33.3%
	n = 99

Q-27 Do you have any concerns about the land exchange ITSELF, <u>not</u> including the proposed mine?

1) YES -- What are those concerns?	23.7%
2) NO	76.3%
	n = 97

Q-28 What are the most important <u>positive</u> effects that the mine would have on the area?

Q-29 What are the most important <u>negative</u> effects that the mine would have on the area?

Q-30 Which <u>ONE</u> of the following

APPENDIX 9
ENROLLMENT PROJECTIONS

The procedures for developing school enrollment projections by grade was separated into three distinct steps; development of birth survival ratios; development of grade retention ratios; and applications of the above ratios to birth and enrollment data to make the actual projections.

Development of Birth Survival Ratios

Birth survival ratios are defined as the rate at which births "survive" to a given school grade. For example, birth survival ratios for the first grade in Musselshell County are the actual county enrollments in the first grade for any given year divided by the number of births that occurred during the school year 6 years before. The algorithm for computing birth survival ratios is given as:

$$BSR^{k}_{j} = SE^{k}_{j}/B^{j-6}$$

where:

BSR^{k}_{j} = Birth survival rate for the k^{th} grade during the j^{th} school year

SE^{k}_{j} = School enrollment for the k^{th} grade during the j^{th} school year

B_{j-6} = Births corresponding to the j^{th} school year 6 years earlier

As an example, the birth survival ratio for the first grade in Musselshell County for school year 1987/88 is given as:

$$BSR^{1}_{1987\text{-}1988} = SE^{1}_{1987\text{-}88}$$

$$B_{1981\text{-}82}$$

$$= 61/82$$

$$= .744$$

Since the number of births is reported by calendar year, it is necessary to adjust these births by developing an estimate of school year births. This is accomplished by taking three-fourths of the births for any given year and adding that figure to one-fourth of the resident births that occurred the previous year.

The equation for estimating Musselshell County school year births is:

$$SYB_{j} = 1/4 * Bi \# 3/4 * B_{i+1}$$

where:

SYB_{j} = Births for school year j

B_{i} = Births in calendar year i

B_{i+1} = Births in calendar year i+1 where school j spans calendar years i and i+1

For instance, the number of school year births for 1981-82 would be:

$$SYB_{1981\text{-}82} = 1/4 * B_{1981} + 3/4 * B_{1982}$$

$$= 1/4 * 82 + 3/4 * 82$$

$$= 82$$

$SYB_{1981\text{-}82}$ would correlate to school year 1988-89 when developing birth survival rates. Birth survival rates would then be calculated as follows:

$$BSR^{k}_{j} = SE^{k}_{j}/SYB_{j-7}$$

Development of Grade Retention Rates

Development of grade retention ratios is a straightforward process. The enrollment for a given grade in any one year is divided into the number of students in the following grade one year later. These are called "forward" grade retention rates. Backward grade retention rates are computed by dividing the enrollment for a given grade in any one year into the number of students in the previous grade during the prior year. Backward grade retention rates are usually developed for kindergarten, which allows one to project backwards from grade 1 to kindergarten.

The algorithms for computing retention rates are given as:

Forward Retention Rates

$$RR^{k,k+1}_{j,j+1} = SE^{k+1}_{j+1}/SE^{k}_{j}$$

where:

$RR^{k,k+1}_{j,j+1}$ = Retention rate from grade k in school year j to grade k+1 in school year j+1

SE^{k+1}_{j+1} = School enrollment in grade k+1 during school year j+1

SE^{k}_{j} = School enrollment in grade k during school year j+1

Backward Retention Rates

$$RR^{k,k-1}_{j,j-1} = SE^{k-1}_{j-1}/SE^{k}_{j}$$

As an example, the forward retention rate for Musselshell County for grade 5 to grade 6 from school year 1986/87 to school year 1987/88 would be:

$$RR^{5,6}_{1986\text{-}87} = SE^{6}_{1987\text{-}88} /SE^{5}_{1986\text{-}87}$$

$$= 76/72$$

$$= 1.056$$

As previously stated, the fact that the retention rate is less than one is an indication of student dropouts, retardation, net out-migration, or a combination of these three. Retention rates greater than one are indicative of in-migration, retardation, and student dropouts.

Retention rates were developed for years 1980 through 1988. To compute an average retention rate, a forward weighting system was used where the most recent year (1987/88) retention rate was given the highest weight.

Development of Enrollment Projections

Once the birth survival rates were computed and the retention rates were developed, these ratios were applied to the birth and enrollment data for the county and school district enrollments. Birth data for the district were estimated using district enrollment to county enrollment ratios and applying the figures to the county birth data.

APPENDIX 10

DATA ADEQUACY

Data adequacy standards were developed for the Powder River Coal Production Region in November 1987. Their purpose is to define the general data base necessary for coal leasing and mitigation decisions in the region (Powder River Region Data Adequacy Standards (PRDAS), 1987). Decision-makers use these standards to determine whether their coal leasing decisions and recommendations have a solid data foundation on whether:

(1) to lease a delineated coal tract;
(2) to make a determination on fair market value for a given tract; and
(3) to make a determination of the special set of lease stipulations for a proposed lease tract (PRDAS, 1987).

Several things merit discussion on these standards and their applicability to this project. To begin with, these data adequacy standards were developed to guide coal leasing decisions for surface coal strip mine operations; only one underground Federal coal mine (Divide/Storm King) exists in the entire Powder River Coal Production Region (Don Brabson, Project Manager, Powder River Coal Production Region, Bureau of Land Management, Wyoming State Office. Personal communication, April 1989). The standards serve as the starting point for determining whether sufficient data exists to lease coal; resource specialists and decision makers must use professional discretion in making any data adequacy determination (PRDAS, 1987).

BLM is making a decision on a proposed coal for land exchange as the proposed action and analyzing coal for coal exchanges, leasing coal and no action as alternatives. The proposed development of the coal lands is an underground coal mine operation, not surface strip mining. Based on this, BLM has determined that sufficient justification exists for variation from these standards. Resource information and its comparability to data adequacy standards is listed below:

Resource Data	*Comparability*[1]	*Adequacy*[2]
1. Geology	Exceeds standards	Excellent
2. Soils/Reclamation	Meets standards	Very good
3. Hydrology	Meets standards	Very good
4. Wildlife	Does not meet all standards	Adequate
5. Air Quality	Meets standards	Very good
6. Cultural	Does not meet all standards	Adequate
7. Socio-Economics	Meets standards, except I/O Model	Very good
8. Vegetation and Land Use	Meet standards	Very good

[1]Comparability — comparison of existing data and information used for this EIS and how it compares to the Powder River Data Adequacy Standards.
[2]Adequacy — adequacy of the data and information used in this EIS for making a decision on whether to exchange or lease these Federal coal lands.

APPENDIX 11

SUMMARY OF COAL MARKET CONDITIONS AFFECTING DEVELOPMENT OF THE BULL MOUNTAINS PROPERTY

Prepared by

Northwest Regional Evaluation Team

The property being considered for the proposed Bull Mountains Exchange is located on the Northwestern edge of the Powder River Basin. As a result, the near and long term coal market conditions affecting the Powder River Basin would have a direct influence on the marketability of coal from a proposed underground mine on the Bull Mountains property.

Background

The Powder River Basin is about 90 miles wide and more than 200 miles long and encompasses an area of about 20,000 square miles in both Northeastern Wyoming and Southeastern Montana. It contains the Nation's largest surface coal mines, the thickest coal beds and vast reserves of low sulfur coal (United States Department of Energy, Energy Information Administration. 1986). As a result, this area has been the fastest growing coal producing region over the last decade and currently produces approximately half the coal mined in the western U.S.

Coal mined from the Powder River Basin is sub-bituminous in grade, and the calorific content generally ranges from 15 to 19 million BTU's per ton. This heating value is approximately 75 percent of the thermal energy contained in bituminous coal; but the lower energy content of Powder River Basin coal is more than offset by its low sulfur content, which usually averages less than one half percent, and the relatively low mining costs.

Before the enactment of clean air standards for sulfur dioxide, Powder River coals were generally bypassed in favor of higher quality bituminous coals that were generally higher in sulfur content and located closer to consumers. However, many of the low sulfur bituminous coal deposits have already been mined or must be mined by more expensive underground mining methods (United States Department of Energy, Energy Information Administration, 1986). The result is an increase in demand for Powder River Basin coal due to both its low sulfur content and low mining costs.

Coal Demand and Supply Relationships

Coal development began in the Powder River Basin in the 1960's, but it was not until the 1970's that significant interest in the Basin emerged. One major event that fueled this growth was the 1973 Arab Oil embargo which fostered rapidly increasing petroleum prices and a renewed interest in the use of coal for new electric power generation facilities. As a result, much of the interest in new coal production was focused on western coal fields; especially the Powder River Basin which is known for it's thick coal seams and low production costs.

This sparked new capital investment targeted for large scale mining operations in the Powder River Basin and coal production from the Powder River Basin grew at an accelerated rate during the 1970's and early 1980's.

Figure 1 illustrates the phenomenal growth occurring in the Basin between 1970 and 1986. In 1970, the production from the Basin was slightly over seven million tons. By 1987, production had grown to over 162 million tons per year. This is an average increase of more than 128 percent per year for the 17 year period.

Private research firms and the U.S. Government projected large increases in domestic coal demand (mostly from utilities) during the 1980 to 1990 period. For example, demand for Powder River Basin coal was forecast to increase from ten million tons per year in 1970 to 180 million tons per year in 1985 (Boulder Exploration Group Incorporated, 1983). However, these coal demand expectations did not fully materialize due to a soft demand for electricity.

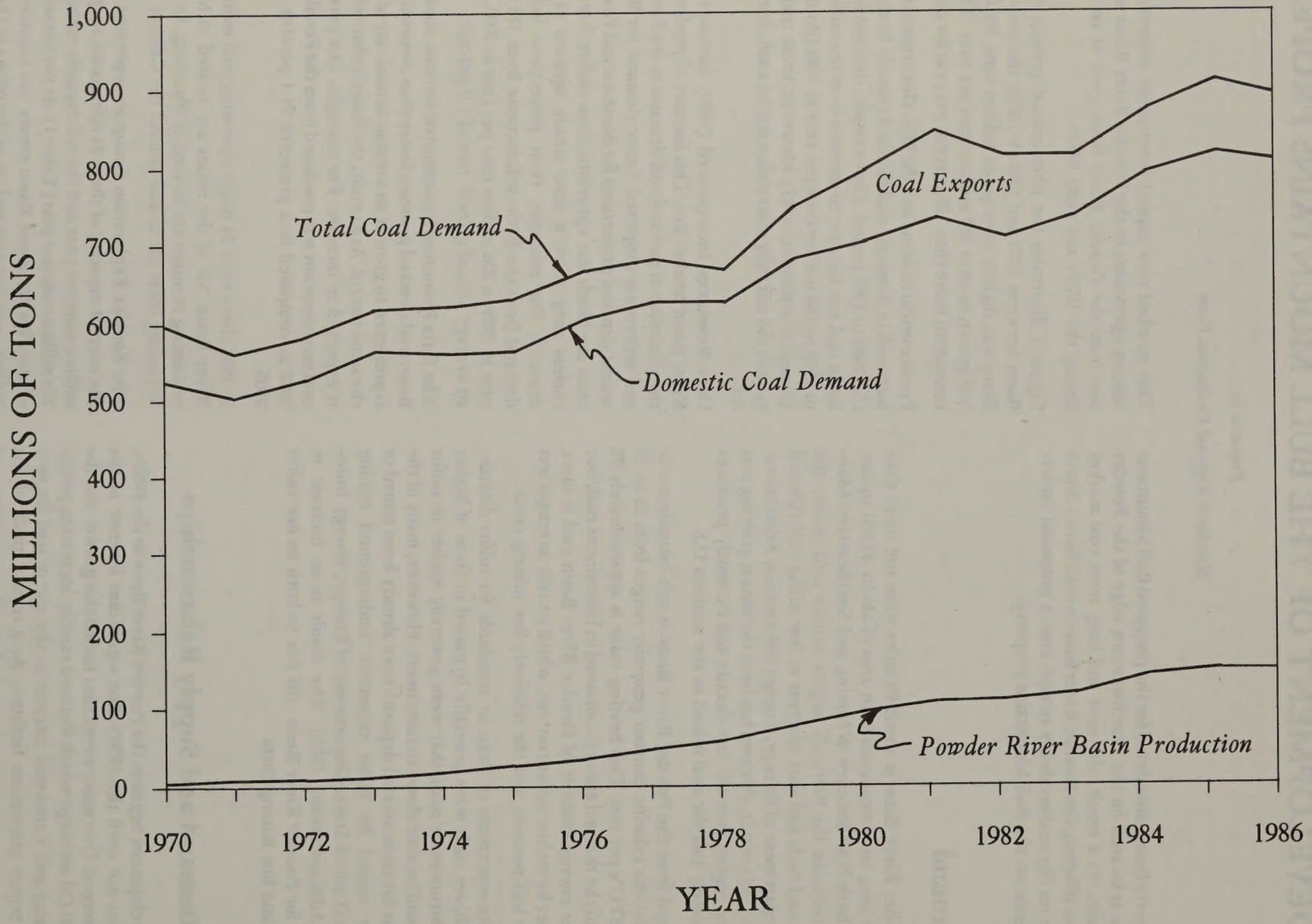
Data Resources Incorporated (1989) forecasts future Powder River Basin production. This forecast of production is based on the allocation of national coal demand to the Powder River Basin and represents projected future demand for Basin coal. Their recent demand projections for domestic and Powder River Basin coals are much less optimistic than earlier forecasts, but nonetheless they show a slow steady upward expansion in coal demand. For example, their projections indicate that coal demand from the Basin will increase from 173 million tons per year in 1989 to 226 million tons per year in 2005. This represents an average annual growth rate of 1.9 percent.

The Data Resources Incorporated forecast shows Powder River Basin coal demand growing faster than domestic demand, which is projected to grow at an average annual rate of 1.6 percent over the same period. As a result, the Basin's share of the coal market is expected to increase. For example, 19.4 percent of domestic coal consumption was produced from the Powder River Basin in 1987 as compared to a projected 21.1 percent market share in 2005.

In 1987 there were 24 major operating coal mines in the Powder River Basin. Six of the mines are located in Montana and the remaining 18 mines are located in Wyoming. Of the 18 located in Wyoming most are in and around the Gillette area.

The Boulder Exploration Group Incorporated (1988) estimates the current capacity of these 24 operations at approximately 221 million tons per year and the full capacity rating is slightly over 294 million tons per year (Table 1). At the present time, only one of the Powder River Basin mines has capacity in excess of 20 million tons per year and six of the mines in the Basin are rated with a capacity of 15 million tons per year or more. However, at full capacity, there would be five mines with capacity in excess of

FIGURE 1
UNITED STATES COAL DEMAND
AND POWDER RIVER BASIN SUPPLY



SOURCE: U.S. Department of Energy, Energy Information Administration, 1988.
State of Wyoming, State Inspector of Mines, 1970 to 1987.
State of Montana, Department of Revenue and Corporate Tax, 1970 to 1987.

APPENDIX 11 — TABLE 1

POWDER RIVER BASIN MINE SUPPLY CAPABILITY

Mine Name	*Mine Status*	*Mine Location*	*Current Capacity (1,000 Tons)*	*Full Capacity (1,000 Tons)*	*1986 Coal Production (1,000 Tons)*	*1987 Coal Production (1,000 Tons)*	*Current Capacity Less 1987 Production*	*Full Capacity Less 1987 Production*
Absaloka	Operating	Montana	9,000	15,000	2,030	1,671	7,329	13,329
Big Sky	Operating	Montana	4,600	4,600	2,595	3,235	1,365	1,365
Colstrip	Operating	Montana	15,000	15,000	12,079	12,063	2,938	2,938
East Decker	Operating	Montana	10,000	8,000	5,400	4,516	5,484	3,484
Spring Creek	Operating	Montana	7,000	7,000	4,664	6,557	443	443
West Decker	Operating	Montana	10,000	8,000	6,760	5,653	4,347	2,347
Subtotal-Montana			55,600	57,600	33,529	33,695	21,905	23,905
Antelope	Operating	Wyoming	3,000	12,000	1,710	2,554	446	9,446
Belle Ayr	Operating	Wyoming	16,000	16,000	12,146	13,330	2,670	2,670
Big Horn	Operating	Wyoming	4,500	4,500	1,361	1,201	3,299	3,299
Black Thunder	Operating	Wyoming	24,000	25,000	21,868	19,273	4,727	5,727
Buckskin	Operating	Wyoming	4,500	8,000	3,996	5,738	(1,238)	2,262
Caballo	Operating	Wyoming	12,000	24,000	7,273	11,684	316	12,316
Caballo Rojo	Operating	Wyoming	7,500	15,000	3,990	6,490	1,010	8,510
Clovis Point	Idled	Wyoming	4,200	4,200	1,435	1,509	2,691	2,691
Coal Creek	Operating	Wyoming	6,000	12,000	1,111	2,362	3,638	9,638
Cordero	Operating	Wyoming	12,000	24,000	11,314	11,943	57	12,057
Dave Johnston	Operating	Wyoming	3,700	3,700	3,051	2,547	1,153	1,153
Eagle Butte	Operating	Wyoming	15,000	26,000	12,000	12,977	2,023	13,023
Fort Union	Operating	Wyoming	1,200	1,200	219	394	806	806
Jacobs Ranch	Operating	Wyoming	18,000	15,000	12,051	11,159	6,841	3,841
North Antelope	Operating	Wyoming	6,000	6,000	5,690	5,338	663	663
Rawhide	Operating	Wyoming	16,000	24,000	12,404	10,673	5,327	13,327
Rochelle	Operating	Wyoming	2,000	11,000	3,570	6,436	(4,436)	4,564
Wyodak	Operating	Wyoming	10,000	5,000	2,600	2,976	7,024	2,024
Subtotal-Wyoming			165,600	236,600	117,789	128,583	37,017	108,017
Total			221,200	294,200	151,318	162,278	58,922	131,922

Source: Boulder Exploration Group, Incorporated, 1988.

20 million tons per year and 10 mines with a capacity rating of 15 million tons per year or more.

In 1987, coal from the Powder River Basin was consumed by utilities in 19 states, including Montana and Wyoming (United States Department of Energy, Energy Information Administration, 1988b). The states receiving coal from the Powder River Basin ranged from the Pacific northwest to the upper Midwest and south to the states of Texas and Louisiana. Texas represented the largest consumer of Powder River coal at about 29.4 million tons annually. Oregon and Washington are the smallest consumers with a total combined annual consumption of about 450 thousand tons.

Approximately 159 million tons of coal out of the 162 million tons produced in the Powder River Basin in 1987 were delivered to utilities with a generating capacity of 50 megawatts or more. However, total 1987 coal production from the Powder River Basin represents only 73 percent of current capacity and 55 percent of full productive capacity.

The projected growth in coal demand predicted in the late 1970's did not fully materialize; and as a result, the current productive capacity of the Basin far exceeds present demand. To illustrate this point, Data Resources Incorporated projects the production from the Powder River Basin is forecast to increase to 226 million tons per year by the year 2005 (Data Resources Incorporated, 1989). Although this forecast indicates a substantial growth in Powder River Basin demand by the year 2005, the projections are only slightly above the current capacity estimate of 221 million tons per year. More importantly, the 2005 forecast demand for the Basin is less than 77 percent of full capacity for existing mines.

Coal Prices

The average price of bituminous coal and lignite sold in the United States was increasing on a nominal dollar basis up through 1982, and has steadily decreased since that time. However, on a real dollar basis (corrected for inflation), the average price of bituminous coal and lignite has declined since 1978. In comparison, the average price of coal sold from Campbell County, Wyoming and Big Horn County, Montana showed a steady increase in nominal terms through 1982 and 1984, respectively; but real coal prices started to decline in both Campbell and Big Horn counties after 1982.

The average price of coal sold from Powder River Basin mines located in Big Horn County, Montana and Campbell County, Wyoming peaked at $17.02 per ton in 1984. Since 1984, the

average coal prices in Montana and Campbell County, Wyoming have shown a steady decline and were reported at $12.43 and $7.83 per ton, respectively, in 1987 (United States Department of Energy, Energy Information Administration, 1977 to 1987). It should be noted that these average coal prices represent a composite price of all coal sales including long term contacts as well as short term and spot coal sales.

Since the early to mid 1980's, the spot market price for coal has fallen far below the average price for all coal sales. For example, the current spot price reported in Coal Week (McGraw Hill Incorporated, 1989) for Montana and Wyoming coal is $5.06 per ton (9,300 BTU's per pound) and $4.00 per ton (8,500 BTU's per pound) respectively. In the recent past, spot coal prices for Wyoming Powder River Basin coal have been reported at or below $3.00 per ton.

Lower open market prices are a reflection of the current soft coal market in the Powder River Basin. This is due to the slower than expected growth in coal demand coupled with the hugh excess in supply capacity of mines in the Basin. These lower spot coal sales prices have produced a downward pressure on coal prices for new contracts and the result is a declining average coal price for mines in the Basin.

To further exacerbate this problem, electric utilities have, within the legal confines of their existing contracts, reduced their coal acquisition costs by minimizing the deliveries of higher cost contract coal and making up the balance of their coal demand from lower cost open market coal purchases. And, in some instances, utilities have taken legal action to break or force renegotiation of older high cost fuel supply contracts.

The price of Powder River Basin coal is projected to remain low until the growth in demand absorbs some of the excess productive capacity in the Basin. Data Resources Incorporated projects marginal mine mouth prices for low sulfur Powder River Basin coal at $7.93 and $8.38 per ton (1988 dollars) in the years 2000 and 2005, respectively. As a comparison, the forecast price for the year 2005 is only $0.27 per ton higher than the real 1987 average price for coal in Campbell County, Wyoming (1988 dollars).

New Mine Development

The Bull Mountains Coal Tract must compete with existing coal mines and other undeveloped coal properties in the Powder River Basin in order to capture a share of the coal market. Some of the factors that influence the competitiveness of the Bull Mountains Tract in comparison to existing mines and other undeveloped coal properties are: the minimum economic selling price of coal from the property (breakeven price), location of the coal property in relation to potential markets, transportation access to the property and coal quality.

The minimum economic selling price for a proposed mining operation on the Bull Mountains property is important in determining the competitiveness of this proposed mining venture compared with other developed and undeveloped mining operations in the region. It should be noted that the minimum selling price for a new mining operation is generally higher compared to an existing mine because the coal sales price must cover all the capital and operating costs of the mine in addition to paying a sufficient rate of return on investment capital necessary to finance mine development. Therefore, most of the existing mines in the Basin which have been in operation for a number of years, have recovered all or a major portion of their up front investment costs. As a result, the existing mining operations can sell coal and make a profit at prices close to their cash costs of production.

Given the current excess productive capacity in the Basin, competition among existing producers for new coal sales opportunities is very keen. Therefore, new coal properties like the Bull Mountains Tract will find it extremely difficult to compete with existing mines until some of the excess capacity in the Basin is absorbed. And, as discussed above, there is already sufficient capacity in the Basin to meet projected demand through the year 2000. This means that the existing mines have the potential to expand their individual production and provide the supply capacity to meet demand requirements well into the next century.

In general, it is more expensive to produce coal underground than it is to produce coal from surface mines. Therefore, even though comprehensive underground mining cost data are not readily available; it is safe to conclude that, all other things being equal, an underground mine is less competitive than a surface mine. Furthermore, given the intense competition in the coal industry, the coal sale price provides an excellent indicator of production costs and more specifically a proxy for the minimum selling price requirement. For instance, in 1987 there were 5.6 million tons of underground coal produced in Colorado at a price of $28.16 per ton and 16.5 million tons produced in Utah at an average price of $25.70 per ton. Based on these prices for underground mined coal in Colorado and Utah, a $20.00 to $30.00 per ton minimum selling price for underground mined coal on the Bull Mountains property would seem reasonable. Existing underground coal prices in Colorado and Utah may reflect some older more lucrative contract prices, but these prices also represent a higher BTU product as compared to coal in the Bull Mountains area; so this range of prices provides a reasonable indicator of the expected minimum selling price for underground coal produced from the Bull Mountains property.

As stated earlier, the ability for a new mine to compete for new coal markets is a function of the delivered coal cost at a specific market which is directly linked to the minimum selling price at the mine and the transportation cost to market. For the Bull Mountains property, the closest coal markets would be in the northern tier states, upper midwestern states and possibly exports to far east nations should that market develop. However, there is more than 20 million tons of excess capacity already available in Montana Powder River Basin Mines. In addition, there are other existing mines and undeveloped coal tracts in both Montana and Wyoming that could potentially out compete the Bull Mountains property for new sales.

Summary and Conclusion

Future development of the Bull Mountains property is directly affected by the coal market conditions in the Powder River Basin. Coal market conditions in the Basin are currently very soft as a result of the over supply capacity built during the rapid

expansion that occurred in the late 1970's and early 1980's and slower than expected growth in coal demand.

Coal prices have declined since the peak of the early 1980's, and prices are expected to remain weak until some of the surplus supply capacity is absorbed. Given the forecast for future growth in demand, Powder River Basin coal supply and demand may not achieve an equilibrium balance until well into the next century. These factors couple with the higher cost of underground mined coal could delay development of coal reserves in the Bull Mountains region by as much as 20 to 40 years in the future.

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APPENDIX 12

METHODOLOGY FOR GRAVITY MODEL ALLOCATION

The number of expected non-local (in-migrating) workers for the two scenarios (0.5 million tons and 3.0 million tons) was estimated using local hire ratios supplied by the mining companies (Table 1). Non-local workers were then distributed to sub-areas or communities within the study area using a residential predication gravity model. Sub-areas used in the allocation process were the city of Billings, the municipality of Roundup, rural Roundup, the Bull Mountains area (part of the Klein census division), north rural Yellowstone County (part of North Yellowstone census division), the Shepherd census division, and the Huntley area.

The gravity model for the distribution scheme was of the form:

$$IW_i = \frac{X_i}{X} * TIW$$

where:

IW_i = Number of in-migrating workers settling in sub-area i

X_i = Attractiveness of sub-area

X = The sum of the attractiveness of the sub-areas

TIW = Total number of in-migrating workers required for each scenario

Variables used to develop estimates of the attractiveness (Xi) of each sub-area were the 1980 population of the sub-area (a proxy for the measure of services and size of potential labor force) and distance from the sub-area to the project site. The distance from each of the sub-areas to the regional trade center (Billings) was also used to define the attractiveness of each of the sub-areas. In summary, the attractiveness of each of the sub-areas can be stated as:

$$X_i = \frac{P_i}{D_{ij}^{b} \; D_{it}^{c}}$$

where:

X_i = Attractiveness of sub-area

P_i = Population of sub-area

D_{ij} = Distance between sub-area i and project j

D_{it} = Distance between sub-area i and trade center t

b = Distance elasticity which measures the responsiveness of non-local workers to distance from project

c = Distance elasticity which measures the responsiveness of non-local workers to distance from regional trade center

Estimates of the distance elasticity have been developed and published in various studies of operating and construction workers in power plant and coal mine developments in North Dakota, Wyoming, and Montana (Wieland, et al., 1977).

Three separate gravity models were utilized to develop distribution estimates for the aforementioned sub-areas. The results from these models were then averaged to develop one distribution scheme. The principal reason for averaging the model was that there was no apparent advantages or disadvantages in using one model or another. The three models used the following distance elasticities.

Model 1:	b = 1.079	
	c = 0.181	(Wieland, et al., 1977)
Model 2:	b = 1.098	
	c = 0	(Wieland, et al., 1977)
Model 3:	b = 0.849	
	c = 0	(Mountain West Research, Inc., no date)

Table 2 lists the results of the three gravity models applied to respective population and distance data. The population of each of the sub-areas is actual 1980 census data or estimated census data. The distance from each of the sub-areas to the project site was estimated using a road map.

Since the distribution for some sub-areas was minor (i.e., small number of in-migrants), the areas were accumulated into larger geographical areas; principally, rural Yellowstone County, rural Musselshell County, the municipality of Roundup, and the city of Billings (including Billings Heights). The final average distribution for these areas was Roundup (13 percent), Billings (74 percent), rural Yellowstone County (7 percent), and rural Musselshell County (6 percent). The distribution results imply that if 100 workers moved into the study area due to the project, one could reasonably expect that 74 workers would move to Billings, 13 workers would move to Roundup, six workers would reside in rural Musselshell County, and seven workers would live in rural Yellowstone County.

Several factors may influence where the workers decide to establish residence that are not necessarily addressed in the gravity model. One factor is the availability of housing. Ample housing is most likely available in Billings to accommodate the 74 percent distribution; however, the opposite may be true for rural Yellowstone and Musselshell counties. The gravity model also assumes that all roads to the project site are similar in construction and maintenance. This factor may be important when one community has an interstate highway connecting it to the project site and another community has a county road linking it with the project site. In the present setting, the road factor should not be a prevalent problem since most roads to the project site are similar in design and construction. Nevertheless, the results of gravity models should be used with some caution as they are the simple mathematical manipulation of indicators, not necessarily the forecast of actual occurrence.

APPENDIX 12 — TABLE 1

LOCAL HIRE RATIOS

Category	1990		1991				1992				1993				1994				1995			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
0.5 Million Tons Mine																						
Mine Construction	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mine Operations	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Loading Facility Construction	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Loading Facility Operations	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Transportation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3.0 Million Tons Mine																						
Mine Construciton	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Mine Operations	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Loading Facility Construction	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Loading Facility Operations	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Transportation Construction	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Transportaiton Operations	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90

Source: U.S. Department of the Interior, Bureau of Land Management, Miles City, Montana, Bull Mountains Exchange Preparation Plan, January 1989.
Yellowstone Coal Company and Meridian Minerals Company development estimates.

APPENDIX 12 — TABLE 2

BULL MOUNTAINS STUDY AREA —
GRAVITY MODEL ALLOCATION

Model/Sub-Area	*Population*	*Average Distance to Trade Center*	*Average Distance to Project*	*Distribution*
Model 1 (b=1.079, c=-.181)				
Rural Musselshell County	200	45	10	.02
Roundup Town	2,119	52	10	.19
Klein Division	400	35	5	.07
North Yellowstone	1,000	20	20	.03
Shepherd Division	2,556	8	35	.04
Huntley Project	1,000	11	40	.01
Billings (Including Heights)	75,278	1	45	.64
Model 2 (b=1.098, c=0)				
Rural Musselshell County	200	45	10	.01
Roundup Town	2,119	52	10	.11
Klein Division	400	35	5	.05
North Yellowstone	1,000	20	20	.02
Shepherd Division	2,556	8	35	.03
Huntley Project	1,000	11	40	.01
Billings (Including Heights)	75,278	1	45	.76
Model 3(b=0.849, c=0)				
Rural Musselshell County	200	45	10	.01
Roundup Town	2,119	52	10	.08
Klein Division	400	35	5	.03
North Yellowstone	1,000	20	20	.02
Shepherd Division	2,556	8	35	.03
Huntley Project	1,000	11	40	.01
Billings (Including Heights)	75,278	1	45	.81

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

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APPENDIX 13

ASSUMPTIONS FOR LOCAL GOVERNMENT FINANCES

Gross Proceeds

Gross proceeds were estimated using the projected production figures presented in the text and a coal price of $15 per ton. Mill levies in 1987/88 were used to develop estimates of revenue for each local government (64.37 mills for Musselshell County and 61.79 for local school districts).

Mine and Employment

For the low scenario (0.5 million tons production) in Musselshell County, the market valuation for Class IV property (40-year life) was $500,000 in 1991 dollars. This was depreciated at a rate of 2.5 percent per year. The Class VIII property (20-year life) was valued at $500,000 and the Class IX property (10-year life) was valued at $1,000,000. Class X property (7-year life-trucks) was valued at $75,000 per truck/trailer combination. In addition, in Yellowstone County, the loading facility was valued at $250,000.

For the high scenario (3.0 million tons production), the market valuation for Class IV property was estimated to peak at $23.2 million in Musselshell County and $0.5 million in Yellowstone County. Class VIII property (mining equipment) was projected to peak at $23.2 million for Musselshell County (1995) and $9.5 million for Yellowstone County (1997). These valuations were apportioned to counties depending upon production. The Class X property (trucking) was allocated to Musselshell County and valued at $75,000 per truck/trailer combination. Trucking was assumed to commence in 1991 and end in 1993 when the railroad spur is finished. The railroad (Class XV property) was valued at $11.0 million, with $6.0 million apportioned to Musselshell County and $5.0 million apportioned to Yellowstone County. Valuation for the railroad was estimated at $70 per foot for a distance of 30 miles. Mill levy rates for 1987/88 were used to determine the amount of taxes to be paid in Musselshell and Yellowstone counties.

State of Montana Revenues

The coal revenue tax and the resource indemnity trust tax were estimated using $15 per ton coal. Diesel fuel taxes were estimated assuming the number of trips presented in the transportation section of the text, a $0.20 per gallon tax rate, and a 5-mile per gallon usage. Property taxes were estimated using the aforementioned taxable valuation figures and the 1987/88 mill levies for Musselshell and Yellowstone counties.

Federal Revenues

Individual payroll taxes were estimated using a tax rate of 9.2 percent and the projected payroll figures presented in the text. Diesel fuel taxes were estimated in the same manner as the state diesel fuel revenues, except a tax rate of $0.151 per gallon was used. The abandoned mine tax used was $0.15 per ton and the black lung tax rate was assumed to be 4.4 percent.

APPENDIX 14
IN-MIGRATION DISTRIBUTION BACKGROUND

APPENDIX 14 — TABLE 1

PROJECTED MIGRATION — ROUNDUP (0.5 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
ROUNDUP CUMULATIVE MIGRATION																						
Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Children — Total	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
K-8	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CUMULATIVE MIGRATION	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
ROUNDUP NET MIGRATION																						
Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K-8	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 2

PROJECTED MIGRATION — BILLINGS (0.5 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
BILLINGS CUMULATIVE MIGRATION																						
Construction Workers	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4
Indirect Workers	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spouses	0	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
Children — Total	0	3	3	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5
K-8	0	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3
9-12	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Not in School	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL CUMULATIVE MIGRATION	1	9	9	8	9	9	9	9	9	9	13	13	13	13	13	13	13	13	13	13	13	13
BILLINGS NET MIGRATION																						
Construction Workers	1	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	1	-1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	3	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
K-8	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
9-12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	1	8	0	-1	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 3

PROJECTED MIGRATION — RURAL MUSSELSHELL COUNTY (0.5 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995			
Area	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
RURAL MUSSELSHELL COUNTY CUMULATIVE MIGRATION																						
Construction Worker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CUMULATIVE MIGRATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RURAL MUSSELSHELL COUNTY NET MIGRATION																						
Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 4

PROJECTED MIGRATION — RURAL YELLOWSTONE COUNTY (0.5 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995			
Area	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
RURAL YELLOWSTONE COUNTY CUMULATIVE MIGRATION																						
Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CUMMLATIVE MIGRATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RURAL YELLOWSTONE COUNTY NET MIGRATION																						
Construction Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 5

PROJECTED MIGRATION — BULL MOUNTAINS STUDY AREA (0.5 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
TOTAL BULL MOUNTAINS STUDY AREA CUMULATIVE MIGRATION																						
Construction Workers	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	3	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5
Indirect Workers	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spouses	0	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4
Children — Total	0	3	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6	6	6	6
K-8	0	1	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4
9-12	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Not in School	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL CUMULATIVE MIGRATION	1	9	12	11	12	12	12	12	12	12	16	16	16	16	16	16	16	16	16	16	16	16
TOTAL BULL MOUNTAINS STUDY AREA NET MIGRATION																						
Construction Workers	1	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	1	-1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	3	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
K-8	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
9-12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	1	8	3	-1	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 6

PROJECTED MIGRATION — ROUNDUP (3.0 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995				1996			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
ROUNDUP CUMULATIVE MIGRATION																										
Construction Workers	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	1	4	4	4	4	4	4	4	4	6	6	9	9	7	7	7	7	7	7	7	7	7	7	7	7
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spouses	0	1	3	3	3	3	3	3	3	3	5	5	7	7	6	6	6	6	6	6	6	6	6	6	6	6
Children — Total	0	1	5	5	5	5	5	5	5	5	7	7	11	11	9	9	9	9	9	9	9	9	9	9	9	9
K-8	0	1	3	3	3	3	3	3	3	3	4	4	6	6	4	4	4	4	4	4	4	4	4	4	4	4
9-12	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Not in School	0	0	1	1	1	1	1	1	1	1	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
TOTAL CUMULATIVE MIGRATION	0	3	12	12	12	12	12	12	12	12	18	19	28	28	23	23	23	23	23	23	23	23	23	23	23	23
ROUNDUP NET MIGRATION																										
Construction Workers	1	0	0	0	-1	0	0	0	0	0	1	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	1	3	0	0	0	0	0	0	0	2	0	3	0	-2	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	1	2	0	0	0	0	0	0	0	2	0	2	0	-1	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	1	4	0	0	0	0	0	0	0	2	0	4	0	-2	0	0	0	0	0	0	0	0	0	0	0
K-8	0	1	2	0	0	0	0	0	0	0	1	0	2	0	-2	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	0	3	9	0	0	0	0	0	0	0	6	1	9	0	-5	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 7

PROJECTED MIGRATION — BILLINGS (3.0 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995				1996			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
BILLINGS CUMULATIVE MIGRATION																										
Construction Workers	6	6	6	5	3	3	3	3	3	3	5	5	6	6	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	7	20	20	20	20	20	20	20	20	36	36	49	49	40	40	40	40	40	40	40	40	40	40	40	40
Indirect Workers	0	0	1	3	3	3	3	4	4	4	4	7	7	9	9	7	7	7	7	7	7	7	7	7	7	7
Spouses	3	9	19	20	18	18	18	19	19	19	34	36	46	47	37	36	36	36	36	36	36	36	36	36	36	36
Children — Total	3	12	29	29	28	28	28	29	29	29	50	51	69	70	56	55	55	55	55	55	55	55	55	55	55	55
K-8	1	6	13	13	13	13	13	13	13	13	22	23	32	32	25	26	26	26	26	26	26	26	26	26	26	26
9-12	1	2	6	6	5	5	5	6	6	6	10	10	13	13	11	10	10	10	10	10	10	10	10	10	10	10
Not in School	1	4	10	10	10	10	10	10	10	10	18	18	24	25	20	19	19	19	19	19	19	19	19	19	19	19
TOTAL CUMULATIVE MIGRATION	12	34	75	77	72	72	72	75	75	75	129	135	177	181	142	138	138	138	138	138	138	138	138	138	138	138
BILLINGS NET MIGRATION																										
Construction Workers	6	0	0	-1	-2	0	0	0	0	0	2	0	1	0	-6	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	7	13	0	0	0	0	0	0	0	16	0	13	0	-9	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	1	2	0	0	0	1	0	0	0	3	0	2	0	-2	0	0	0	0	0	0	0	0	0	0
Spouses	3	6	10	1	-2	0	0	1	0	0	15	2	10	1	-10	-1	0	0	0	0	0	0	0	0	0	0
Children — Total	3	9	17	0	-1	0	0	1	0	0	21	1	18	1	-14	-1	0	0	0	0	0	0	0	0	0	0
K-8	1	5	7	0	0	0	0	0	0	0	9	1	9	0	-7	1	0	0	0	0	0	0	0	0	0	0
9-12	1	1	4	0	-1	0	0	1	0	0	4	0	3	0	-2	-1	0	0	0	0	0	0	0	0	0	0
Not in School	1	3	6	0	0	0	0	0	0	0	8	0	6	1	-5	-1	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	12	22	41	2	-5	0	0	3	0	0	54	6	42	4	-39	-4	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 8

PROJECTED MIGRATION — RURAL MUSSELSHELL COUNTY (3.0 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995				1996			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
RURAL MUSSELSHELL COUNTY CUMULATIVE MIGRATION																										
Construction Worker	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	1	2	2	2	2	2	2	2	2	3	3	4	4	3	3	3	3	3	3	3	3	3	3	3	3
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	1	2	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2
Children — Total	0	1	2	2	2	2	2	2	2	2	3	3	5	5	3	3	3	3	3	3	3	3	3	3	3	3
K-8	0	1	2	2	2	2	2	2	2	2	1	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1
9-12	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Not in School	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL CUMULATIVE MIGRATION	1	4	6	6	6	6	6	6	6	6	8	8	12	12	8	8	8	8	8	8	8	8	8	8	8	8
RURAL MUSSELSHELL COUNTY NET MIGRATION																										
Construction Workers	1	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	1	1	0	0	0	0	0	0	0	1	0	1	0	-1	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	1	1	0	0	0	0	0	0	0	0	0	1	0	-1	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	1	1	0	0	0	0	0	0	0	1	0	2	0	-2	0	0	0	0	0	0	0	0	0	0	0
K-8	0	1	1	0	0	0	0	0	0	0	-1	0	2	0	-2	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	1	3	2	0	0	0	0	0	0	0	2	0	4	0	-4	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 9

PROJECTED MIGRATION — RURAL YELLOWSTONE COUNTY (3.0 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995				1996			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
RURAL YELLOWSTONE COUNTY CUMULATIVE MIGRATION																										
Construction Workers	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	1	2	2	2	2	2	2	2	2	3	3	5	5	4	4	4	4	4	4	4	4	4	4	4	4
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	1	2	2	2	2	2	2	2	2	2	2	4	4	3	3	3	3	3	3	3	3	3	3	3	3
Children — Total	0	1	2	2	2	2	2	2	2	2	3	3	6	6	5	5	5	5	5	5	5	5	5	5	5	5
K-8	0	1	2	2	2	2	2	2	2	2	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9-12	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Not in School	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL CUMULATIVE MIGRATION	1	4	7	6	6	6	6	6	6	6	8	8	15	15	12	12	12	12	12	12	12	12	12	12	12	12
RURAL YELLOWSTONE COUNTY NET MIGRATION																										
Construction Workers	1	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	1	1	0	0	0	0	0	0	0	1	0	2	0	-1	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spouses	0	1	1	0	0	0	0	0	0	0	0	0	2	0	-1	0	0	0	0	0	0	0	0	0	0	0
Children — Total	0	1	1	0	0	0	0	0	0	0	1	0	3	0	-1	0	0	0	0	0	0	0	0	0	0	0
K-8	0	1	1	0	0	0	0	0	0	0	-1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
9-12	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not in School	0	0	0	0	0	0	0	0	0	0	1	0	1	0	-1	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	1	3	3	-1	0	0	0	0	0	0	2	0	7	0	-3	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 14 — TABLE 10

PROJECTED MIGRATION — BULL MOUNTAINS STUDY AREA (3.0 MILLION TONS MINE PRODUCTION SCENARIO)

	1990		1991				1992				1993				1994				1995				1996			
Area	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
TOTAL BULL MOUNTAINS STUDY AREA CUMULATIVE MIGRATION																										
Construction Workers	9	9	8	6	3	3	3	3	3	3	6	6	7	7	0	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	10	28	28	28	28	28	28	28	28	48	48	67	67	54	54	54	54	54	54	54	54	54	54	54	54
Indirect Workers	0	0	1	3	3	3	3	4	4	4	4	8	8	10	10	8	8	8	8	8	8	8	8	8	8	8
Spouses	3	12	26	27	25	25	25	26	26	26	43	45	60	61	48	47	47	47	47	47	47	47	47	47	47	47
Children — Total	3	15	38	38	37	37	37	38	38	38	63	64	91	92	73	72	72	72	72	72	72	72	72	72	72	72
K-8	1	9	20	20	20	20	20	20	20	20	28	29	44	44	33	34	34	34	34	34	34	34	34	34	34	34
9-12	1	2	7	7	6	6	6	7	7	7	13	13	17	17	15	14	14	14	14	14	14	14	14	14	14	14
Not in School	1	4	11	11	11	11	11	11	11	11	22	22	30	31	25	24	24	24	24	24	24	24	24	24	24	24
TOTAL CUMULATIVE MIGRATION	14	45	100	101	96	96	96	99	99	99	163	170	232	236	185	181	181	181	181	181	181	181	181	181	181	181
TOTAL BULL MOUNTAINS STUDY AREA NET MIGRATION																										
Construction Workers	9	0	-1	-2	-3	0	0	0	0	0	3	0	1	0	-7	0	0	0	0	0	0	0	0	0	0	0
Mine Workers	0	10	18	0	0	0	0	0	0	0	20	0	19	0	-13	0	0	0	0	0	0	0	0	0	0	0
Indirect Workers	0	0	1	2	0	0	0	1	0	0	0	4	0	2	0	-2	0	0	0	0	0	0	0	0	0	0
Spouses	3	9	14	1	-2	0	0	1	0	0	17	2	15	1	-13	-1	0	0	0	0	0	0	0	0	0	0
Children — Total	3	12	23	0	-1	0	0	1	0	0	25	1	27	1	-19	-1	0	0	0	0	0	0	0	0	0	0
K-8	1	8	11	0	0	0	0	0	0	0	8	1	15	0	-11	1	0	0	0	0	0	0	0	0	0	0
9-12	1	1	5	0	-1	0	0	1	0	0	6	0	4	0	-2	-1	0	0	0	0	0	0	0	0	0	0
Not in School	1	3	7	0	0	0	0	0	0	0	11	0	8	1	-6	-1	0	0	0	0	0	0	0	0	0	0
TOTAL NET MIGRATION	14	31	55	1	-5	0	0	3	0	0	64	7	62	4	-51	-4	0	0	0	0	0	0	0	0	0	0

Source: Economic Consultants Northwest, Helena, Montana, 1989b.

APPENDIX 15

PAYMENT IN LIEU OF TAXES ACT

Explanation of Act

The following excerpt provides a brief description of the Federal payments in lieu of taxes (PILT) Act (U.S. Department of the Interior, Bureau of Land Management, State Office, Billings, Montana, October 1988).

This paper briefly discusses the Payments in Lieu of Taxes Act of 1976, as amended. It describes eligibility for "in-lieu" payments, gives examples of how the payments are computed, and summarizes "entitlement" acres.

The Act authorizes the Secretary of the Interior to make two types of annual payments to eligible units of local government. The Secretary has delegated the responsibility for administering the Act to the Bureau of Land Management.

In October 1976, Congress passed Public Law 94-565, commonly referred to as the "Payments in Lieu of Taxes Act". This Act provides for payments to local units of government containing certain Federally-owned lands. These payments are designed to supplement other Federal land receipt sharing payments local governments may be receiving. Payments received under the Act may be used by the recipients for any governmental purpose. The Act was repealed in September, 1982 and recodified at Chapter 69, 31 U.S.C.

On July 30, 1983, the PILT Act (31 U.S.C.) was amended by P.L. 98-63 which refined the definition of "unit of general local government" and added a new section (31 U.S.C. 6907) that authorized State governments to enact legislation to reallocate PILT payments in whole or in part to other smaller units of general purpose government. The amendment further provides that where States enact such legislation, the PILT funds would be paid to State governments for redistribution to the appropriate unit of general local government. The State of Wisconsin is presently the only State to enact legislation (Wisconsin Act 470) under section 6907.

Section 6902 "Entitlement Land" Payments

Section 6902 authorizes payments to local units of government (generally counties, or the equivalent) under one of two alternatives, based on the number of acres of "entitlement lands" within the county. "Entitlement lands" consist of lands in the National Forest System and the National Park System, lands administered by the Bureau of Land Management, and lands dedicated to the use of Federal water resource development projects. Also included are dredge disposal areas under the jurisdiction of the Army Corps of Engineers, National Wildlife Reserve Areas withdrawn from the public domain, inactive and semi-active Army installations used for non-industrial purposes, and certain lands donated to the United States Government by State and local governments. The Act specifically prohibits payments for tax exempt lands (but not donated lands) acquired from State and local governments.

The amount to be paid to each unit of local government is the higher of:

A. Seventy-five cents for each acre of "entitlement land" within the boundaries of the unit of government, reduced by the amount of certain Federal land payments that were received by the unit of government in the preceding fiscal year.[1]

-OR-

B. Ten cents for each acre of "entitlement land" within the unit of government. Here, no deductions are made for the Federal land payments received by the unit of government in the preceding fiscal year.

Entitlement land payments to each unit of general local government are subject to population payment limitations or ceilings. Payment ceilings are based on a sliding scale, starting at $50 per capita (for population under 5,000) and rising to a maximum of $1,000,000. Under Alternative A, if the total calculated payment (75 cents x entitlement acres) exceeds the ceiling, deduction for other Federal land payments received are made from the ceiling, not from the 75 cents per acre figure.

The following examples show how the section 1 payment is computed.

Example 1 — Payment Alternative A Greater than B:

Population limitations (19,000 x $28)	$532.000
A. 88,442 acres x 75 cents per acre	66,332
Deduction for prior years payments	-36,435
Payment to county — Alternative A	$29,897
B. 88,442 acres x 10 cents per acre	$8,844
No deduction under this alternative	-0
Payment to county — Alternative B	$8,844

In this case, $29,897 would be the payment to the county. If the population limitation had been $50,000, the payment calculated under Alternative A would be $13,565 ($50,000 - $36,435).

Example 2 — Payment Alternative B greater than A:

Population limitations (12,000 x $33)	$396,000
A. 81,391 acres x 75 cents per acre	61,043
Deduction for prior year payments	-62,792
Payment to county — Alternative A	$0
B. 81,391 acres x 10 cents per acre	$8,139
No deduction under this alternative	-0
Payment to county — Alternative B	$8,139

In this case, $8,139 would be the payment to the county.

Example 3 — ceiling in effect — payment limited to population ceiling:

Population limitations ($3,000 x $50)	$150,000
A. 1,700,000 acres x 75 cents per acre	$1,275,000
Population ceiling limit	150,000
Deduction for prior year payments	-$750,000
Payment to county — Alternative A	$0
B. 1,700,000 acres x 10 cents per acre	$170,000
No deduction under this alternative	-0
Payment to county — Alternative B	$170,000
Payment to county — allowed by ceiling	$150,000

In the case of this county with high Federal land ownership and a small population, the ceiling is applied to both alternatives with that ceiling amount being paid to the county under Alternative B.

PILT Payments in Priority Counties

Table 1 lists the entitlement acreage, population, payment ceiling, and the estimated PILT payment for priority counties in FY 1988. As indicated in Table 1, most priority counties involved in the proposed land exchange are well below their limit or ceiling in PILT payments.

APPENDIX 15 — TABLE 1

PILT PAYMENT TO PRIORITY COUNTIES

County	*Entitlement Acreage*	*Population*	*Payment Ceiling*	*Estimated PILT Payment*	*Percent of Ceiling*
Anaconda/ Deer Lodge	183,993	11,000	$374,000	$123,978	33%
Beaverhead	2,049,394	9,000	342,000	226,353	66%
Carbon	560,714	9,000	342,000	322,913	94%
Custer	339,857	13,000	416,000	241,057	58%
Madison	1,055,943	6,000	282,000	217,956	77%

Source: U.S. Department of the Interior, Bureau of Land Management, State Office, Billings, Montana, October 1988. Unpublished data.

Information Sources

U.S. Department of the Interior, Bureau of Land Management, State Office, Billings, Montana, October 1988. Unpublished data.

APPENDIX 16
HYPOTHETICAL FEDERAL ROYALTY CALCULATIONS
1991 and 2020

BULL MOUNTAINS HYPOTHETICAL FEDERAL ROYALTY CALCULATION
0.5 MILLION TONS PER YEAR SCENARIO, YEAR 1991 STARTUP

Project Year	*Calendar Year*	*Price*	*Federal Production*	*Total Revenue*	*Royalty Payments*	*Discounted Royalty Payments*
1	1990		0	$0	$0	$0
2	1991	$15.00	0	$0	$0	$0
3	1992	$15.00	84,000	$1,260,000	$84,504	$69,838
4	1993	$15.00	126,000	$1,890,000	$126,756	$95,234
5	1994	$15.00	168,000	$2,520,000	$169,008	$115,435
6	1995	$15.00	210,000	$3,150,000	$211,260	$131,176
7	1996	$15.00	210,000	$3,150,000	$211,260	$119,251
8	1997	$15.00	210,000	$3,150,000	$211,260	$108,410
9	1998	$15.00	210,000	$3,150,000	$211,260	$98,554
10	1999	$15.00	210,000	$3,150,000	$211,260	$89,595
11	2000	$15.00	210,000	$3,150,000	$211,260	$81,450
12	2001	$15.00	210,000	$3,150,000	$211,260	$74,045
13	2002	$15.00	210,000	$3,150,000	$211,260	$67,314
14	2003	$15.00	210,000	$3,150,000	$211,260	$61,194
15	2004	$15.00	210,000	$3,150,000	$211,260	$55,631
16	2005	$15.00	210,000	$3,150,000	$211,260	$50,574
17	2006	$15.00	210,000	$3,150,000	$211,260	$45,976
18	2007	$15.00	210,000	$3,150,000	$211,260	$41,797
19	2008	$15.00	210,000	$3,150,000	$211,260	$37,997
20	2009	$15.00	210,000	$3,150,000	$211,260	$34,543
21	2010	$15.00	210,000	$3,150,000	$211,260	$31,402
22	2011	$15.00	210,000	$3,150,000	$211,260	$28,548
23	2012	$15.00	210,000	$3,150,000	$211,260	$25,952
24	2013	$15.00	210,000	$3,150,000	$211,260	$23,593
25	2014	$15.00	210,000	$3,150,000	$211,260	$21,448
26	2015	$15.00	210,000	$3,150,000	$211,260	$19,498
27	2016	$15.00	210,000	$3,150,000	$211,260	$17,726
28	2017	$15.00	210,000	$3,150,000	$211,260	$16,114
29	2018	$15.00	210,000	$3,150,000	$211,260	$14,649
30	2019	$15.00	210,000	$3,150,000	$211,260	$13,318
31	2020	$15.00	210,000	$3,150,000	$211,260	$12,107
32	2021	$15.00	210,000	$3,150,000	$211,260	$11,006
33	2022	$15.00	210,000	$3,150,000	$211,260	$10,006
34	2023	$15.00	210,000	$3,150,000	$211,260	$9,096
35	2024	$15.00	210,000	$3,150,000	$211,260	$8,269
36	2025	$15.00	210,000	$3,150,000	$211,260	$7,517
37	2026	$15.00	210,000	3,150,000	211,260	$6,834
38	2027	$15.00	210,000	3,150,000	211,260	$6,213
39	2028	$15.00	210,000	3,150,000	211,260	$5,648
40	2029	$15.00	210,000	3,150,000	211,260	$5,135
41	2030	$15.00	210,000	3,150,000	211,260	$4,668
Total			7,938,000	$119,070,000	$7,985,628	$1,676,763

BULL MOUNTAINS HYPOTHETICAL FEDERAL ROYALTY CALCULATION
3.0 MILLION TONS PER YEAR SCENARIO, YEAR 1991 STARTUP

Project Year	*Calendar Year*	*Price*	*Federal Production*	*Total Revenue*	*Royalty Payments*	*Discounted Royalty Payments*
1	1990		0	$0	$0	$0
2	1991	$15.00	200,000	$3,000,000	$201,200	$182,909
3	1992	$15.00	400,000	$6,000,000	$402,400	$332,562
4	1993	$15.00	500,000	$7,500,000	$503,000	$377,911
5	1994	$15.00	500,000	$7,500,000	$503,000	$343,556
6	1995	$15.00	1,000,000	$15,000,000	$1,006,800	$624,647
7	1996	$15.00	1,200,000	$18,000,000	$1,207,200	$681,433
8	1997	$15.00	1,200,000	$18,000,000	$1,207,200	$619,484
9	1998	$15.00	1,200,000	$18,000,000	$1,207,200	$563,168
10	1999	$15.00	1,200,000	$18,000,000	$1,207,200	$511,971
11	2000	$15.00	1,200,000	$18,000,000	$1,207,200	$465,428
12	2001	$15.00	1,620,000	$24,300,000	$1,629,720	$571,207
13	2002	$15.00	1,620,000	$24,300,000	$1,629,720	$519,279
14	2003	$15.00	1,620,000	$24,300,000	$1,629,720	$472,072
15	2004	$15.00	1,620,000	$24,300,000	$1,629,720	$429,156
16	2005	$15.00	1,620,000	$24,300,000	$1,629,720	$390,142
17	2006	$15.00	980,000	$14,700,000	$985,880	$214,556
18	2007	$15.00	980,000	$14,700,000	$985,880	$195,051
19	2008	$15.00	980,000	$14,700,000	$985,880	$177,319
20	2009	$15.00	980,000	$14,700,000	$985,880	$161,199
21	2010	$15.00	980,000	$14,700,000	$985,880	$146,545
22	2011	$15.00	740,000	$11,100,000	$744,440	$100,597
23	2012	$15.00	740,000	$11,100,000	$744,440	$91,451
24	2013	$15.00	740,000	$11,100,000	$744,440	$83,138
25	2014	$15.00	740,000	$11,100,000	$744,440	$75,580
26	2015	$15.00	740,000	$11,100,000	$744,440	$68,709
27	2016	$15.00	2,040,000	$30,600,000	$2,052,240	$172,194
28	2017	$15.00	2,040,000	$30,600,000	$2,052,240	$156,540
29	2018	$15.00	2,040,000	$30,600,000	$2,052,240	$142,309
30	2019	$15.00	2,040,000	$30,600,000	$2,052,240	$129,372
31	2020	$15.00	2,040,000	$30,600,000	$2,052,240	$117,611
32	2021	$15.00	2,000,000	$30,000,000	$2,012,000	$104,823
33	2022	$15.00	2,000,000	$30,000,000	$2,012,000	$95,293
34	2023	$15.00	2,000,000	$30,000,000	$2,012,000	$86,630
35	2024	$15.00	2,000,000	$30,000,000	$2,012,000	$78,755
36	2025	$15.00	2,000,000	$30,000,000	$2,012,000	$71,595
Total			45,500,000	$682,500,000	$45,773,000	$9,554,192

PROPOSED BULL MOUNTAIN EXCHANGE
FEDERAL ROYALTY CALCULATION FOR MONTANA
YEAR 1991 STARTUP

Royalty Calculation		*Parameters*	
FOB Mine Price/Ton	15.000	Royalty Rate	0.080
—Black Lung	0.632	Contract Sale Price	11.713
—Federal Rec.	0.150	Severance Rate	0.040
—Resource Indemnity	0.053	Mill Levy	0.214
—Gross Proceeds	1.128		
—Severance Tax	0.469		
Royalty Price	12.569		
X Royalty Rate	8.00%		
Federal Royalty/Ton	1.006		

The following assumptions were utilized in this analysis:

1. Coal production from the mining operations would begin in the year 1991 and follow the scenarios provided by the Montana State Office.
2. The discount rate is 10 percent.
3. The base year for discounting is 1990.
4. The coal selling price is $15.00 per ton FOB mine.
5. Federal royalties are calculated using the regulations issued January 13, 1989, (*Federal Register*, Vol. 54, No. 9). These regulations allow deductions for Black Lung Tax, Federal Reclamation Fee, Montana Severance Tax, Montana Gross Proceeds Tax, and Montana Resource Indemnity Trust Tax. This results in an undiscounted royalty of $1.006 per ton.
6. The Severance Tax rate was assumed to be 4 percent and the county mill levy was set at 214.0 which is the rounded average of the current mill levy rates for Musselshell (160.735) and Yellowstone (267.530) Counties.

BULL MOUNTAINS HYPOTHETICAL FEDERAL ROYALTY CALCULATION
0.5 MILLION TONS PER YEAR SCENARIO, YEAR 2020 STARTUP

Project Year	*Calendar Year*	*Price*	*Federal Production*	*Total Revenue*	*Royalty Payments*	*Discounted Royalty Payments*
1	2020	$25.00	0	$0	$0	$0
2	2021	$25.00	84,000	$2,100,000	$141,456	$7,370
3	2022	$25.00	126,000	$3,150,000	$212,184	$10,050
4	2023	$25.00	168,000	$4,200,000	$282,912	$12,181
5	2024	$25.00	210,000	$5,250,000	$353,640	$13,842
6	2025	$25.00	210,000	$5,250,000	$353,640	$12,584
7	2026	$25.00	210,000	$5,250,000	$353,640	$11,440
8	2027	$25.00	210,000	$5,250,000	$353,640	$10,400
9	2028	$25.00	210,000	$5,250,000	$353,640	$9,455
10	2029	$25.00	210,000	$5,250,000	$353,640	$8,595
11	2030	$25.00	210,000	$5,250,000	$353,640	$7,814
12	2031	$25.00	210,000	$5,250,000	$353,640	$7,103
13	2032	$25.00	210,000	$5,250,000	$353,640	$6,458
14	2033	$25.00	210,000	$5,250,000	$353,640	$5,871
15	2034	$25.00	210,000	$5,250,000	$353,640	$5,337
16	2035	$25.00	210,000	$5,250,000	$353,640	$4,852
17	2036	$25.00	210,000	$5,250,000	$353,640	$4,411
18	2037	$25.00	210,000	$5,250,000	$353,640	$4,010
19	2038	$25.00	210,000	$5,250,000	$353,640	$3,645
20	2039	$25.00	210,000	$5,250,000	$353,640	$3,314
21	2040	$25.00	210,000	$5,250,000	$353,640	$3,013
22	2041	$25.00	210,000	$5,250,000	$353,640	$2,739
23	2042	$25.00	210,000	$5,250,000	$353,640	$2,490
24	2043	$25.00	210,000	$5,250,000	$353,640	$2,263
25	2044	$25.00	210,000	$5,250,000	$353,640	$2,058
26	2045	$25.00	210,000	$5,250,000	$353,640	$1,871
27	2046	$25.00	210,000	$5,250,000	$353,640	$1,700
28	2047	$25.00	210,000	$5,250,000	$353,640	$1,546
29	2048	$25.00	210,000	$5,250,000	$353,640	$1,405
30	2049	$25.00	210,000	$5,250,000	$353,640	$1,278
31	2050	$25.00	210,000	$5,250,000	$353,640	$1,161
32	2051	$25.00	210,000	$5,250,000	$353,640	$1,056
33	2052	$25.00	210,000	$5,250,000	$353,640	$960
34	2053	$25.00	210,000	$5,250,000	$353,640	$873
35	2054	$25.00	210,000	$5,250,000	$353,640	$793
36	2055	$25.00	210,000	$5,250,000	$353,640	$721
37	2056	$25.00	210,000	$5,250,000	$353,640	$656
38	2057	$25.00	210,000	$5,250,000	$353,640	$596
39	2058	$25.00	210,000	$5,250,000	$353,640	$542
40	2059	$25.00	210,000	$5,250,000	$353,640	$493
Total			7,938,000	$198,450,000	$13,367,592	$176,941

BULL MOUNTAINS HYPOTHETICAL FEDERAL ROYALTY CALCULATION
3.0 MILLION TONS PER YEAR SCENARIO, YEAR 2020 STARTUP

Project Year	*Calendar Year*	*Price*	*Federal Production*	*Total Revenue*	*Royalty Payments*	*Discounted Royalty Payments*
1	2020	$25.00	200,000	$5,000,000	$336,800	$19,302
2	2021	$25.00	400,000	$10,000,000	$673,600	$35,094
3	2022	$25.00	500,000	$12,500,000	$842,000	$39,879
4	2023	$25.00	500,000	$12,500,000	$842,000	$36,254
5	2024	$25.00	1,000,000	$25,000,000	$1,684,000	$65,916
6	2025	$25.00	1,200,000	$30,000,000	$2,020,800	$71,908
7	2026	$25.00	1,200,000	$30,000,000	$2,020,800	$65,371
8	2027	$25.00	1,200,000	$30,000,000	$2,020,800	$59,428
9	2028	$25.00	1,200,000	$30,000,000	$2,020,800	$54,026
10	2029	$25.00	1,200,000	$30,000,000	$2,020,800	$49,114
11	2030	$25.00	1,620,000	$40,500,000	$2,728,080	$60,277
12	2031	$25.00	1,620,000	$40,500,000	$2,728,080	$54,797
13	2032	$25.00	1,620,000	$40,500,000	$2,728,080	$49,815
14	2033	$25.00	1,620,000	$40,500,000	$2,728,080	$45,287
15	2034	$25.00	1,620,000	$40,500,000	$2,728,080	$41,170
16	2035	$25.00	980,000	$24,500,000	$1,650,320	$22,641
17	2036	$25.00	980,000	$24,500,000	$1,650,320	$20,583
18	2037	$25.00	980,000	$24,500,000	$1,650,320	$18,712
19	2038	$25.00	980,000	$24,500,000	$1,650,320	$17,011
20	2039	$25.00	980,000	$24,500,000	$1,650,320	$15,464
21	2040	$25.00	740,000	$18,500,000	$1,246,160	$10,615
22	2041	$25.00	740,000	$18,500,000	$1,246,160	$9,650
23	2042	$25.00	740,000	$18,500,000	$1,246,160	$8,773
24	2043	$25.00	740,000	$18,500,000	$1,246,160	$7,976
25	2044	$25.00	740,000	$18,500,000	$1,246,160	$7,251
26	2045	$25.00	2,040,000	$51,000,000	$3,435,360	$18,171
27	2046	$25.00	2,040,000	$51,000,000	$3,435,360	$16,519
28	2047	$25.00	2,040,000	$51,000,000	$3,435,360	$15,017
29	2048	$25.00	2,040,000	$51,000,000	$3,435,360	$13,652
30	2049	$25.00	2,040,000	$51,000,000	$3,435,360	$12,411
31	2050	$25.00	2,000,000	$50,000,000	$3,368,000	$11,061
32	2051	$25.00	2,000,000	$50,000,000	$3,368,000	$10,056
33	2052	$25.00	2,000,000	$50,000,000	$3,368,000	$9,142
34	2053	$25.00	2,000,000	$50,000,000	$3,368,000	$8,311
35	2054	$25.00	2,000,000	$50,000,000	$3,368,000	$7,555
Total			45,500,000	$1,137,500,000	$76,622,000	$1,008,208

PROPOSED BULL MOUNTAIN EXCHANGE
FEDERAL ROYALTY CALCULATION FOR MONTANA
YEAR 2020 STARTUP

Royalty Calculation		*Parameters*	
FOB Mine Price/Ton	25.000	Royalty Rate	0.080
—Black Lung	1.054	Contract Sale Price	19.515
—Federal Rec.	0.150	Severance Rate	0.040
—Resource Indemnity	0.088	Mill Levy	0.214
—Gross Proceeds	1.879		
—Severance Tax	0.781		
Royalty Price	21.049		
X Royalty Rate	8.00%		
Federal Royalty/Ton	1.684		

The following assumptions were utilized in this analysis:

1. Coal production from the mining operations would begin in the year 2021 and follow the scenarios provided by the Montana State Office.
2. The discount rate is 10 percent.
3. The base year for discounting is 1990.
4. The coal selling price is $25.00 per ton FOB mine.
5. Federal royalties are calculated using the regulations issued January 13, 1989, (*Federal Register*, Vol. 54, No. 9). These regulations allow deductions for Black Lung Tax, Federal Reclamation Fee, Montana Severance Tax, Montana Gross Proceeds Tax, and Montana Resource Indemnity Trust Tax. This results in an undiscounted royalty of $1.684 per ton.
6. The Severance Tax rate was assumed to be 4 percent and the county mill levy was set at 214.0 which is the rounded average of the current mill levy rates for Musselshell (160.735) and Yellowstone (267.530) Counties.

GLOSSARY

ACCIPITER — Any hawk of the genus *Accipiter* having short, rounded wings and a long tail. Feeds chiefly on small mammals and birds.

ALLUVIAL VALLEY FLOORS — The definition of this phrase as used for surface mining control and reclamation as stated in Public Law 95-87, August 3, 1977 [Section 701(1)] is:

"Alluvial valley floors" means the unconsolidated stream land deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agriculture activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated run-off or slope wash, together with talus, other mass movement accumulation and wind-blown deposits.

ALLUVIUM — Soil and rock debris deposited by streams.

ANIMAL UNIT MONTH (AUM) — A standardized measurement of the amount of forage necessary for the complete sustenance of one animal for one month; also the measurement of the privilege of grazing one animal for one month.

ANION — A negatively charged atom or ion attracted to an anode in electrolysis.

AQUATIC — Living or growing in or on the water.

AQUIFER — A rock formation, group of rock formations or part of a rock formation that contains enough water-saturated permeable material to yield water to a spring or well.

AUTOTROPHIC — A rivers ability to maintain its ecological system (plants, animals) on its own. Supplies own food for organisms living within. In this case the river is not stocked.

BATHOLITH — A large body of igneous rock believed to have crystallized at a considerable depth below the earth's surface.

BITUMINOUS COAL — A soft, dark brown to black coal that burns with a smoky flame; contains more than 14% volatile matter and has a calorific value of more than 11,500 BTU/lb.

BTU (British Thermal Unit) — The amount of heat required to raise the temperature of one pound of water one degree.

BUNCHGRASS — Any variety of grass growing in distinct clumps.

BUTEOS — Any hawk of the genus *Buteo* with broad rounded wings and soaring flight.

CALORIFIC (Value) — For solid and liquid fuels of low volatility, the amount of heat produced by combustion of a specified quantity under specified conditions.

CATION — A positively charged atom or ion attracted to a cathode in electrolysis.

CHANNEL — An open conduit either naturally or artificially created which periodically or continuously contains moving water or forms a connecting link between two bodies of water.

CHANNEL STABILITY — A relative term describing erosion or movement of the channel walls or bottom due to waterflow.

CHARACTERISTIC LANDSCAPE — The established landscape in an area, not necessarily a natural area. It could refer to a farming community, urban area or any other landscape which has an identifiable character.

CLAYEY — A soil containing more than 35% clay. The textural classes are sandy clay, silty clay, clay and clay loam and silty clay loam.

CLAYPAN — A dense, compact layer in the subsoil having a much higher clay content than the overlying material from which it is separated by a sharply defined boundary.

CLIMAX — The highest ecological development of a plant community capable of perpetuation under the prevailing climatic and soil conditions.

COMPACTION — The process of packing firmly and closely together; the state of being so packed, e.g., mechanical compaction of soil by livestock or vehicular activity. Soil compaction results from particles being pressed together so that the volume of the soil is reduced. It is influenced by the physical properties of the soil, moisture content and the type and amount of compactive effort.

CONDUCTANCE (CONDUCTIVITY) — The ability of a substance to transmit an electrical current.

CRATON — A relatively stable, immobile area of the earth's crust that has been little deformed for a long time and forms the nuclear mass of a continent.

CRITICAL WILDLIFE HABITAT — The area of land, water and airspace required for the normal needs and survival of an endangered species.

CRUCIAL WILDLIFE HABITAT — Parts of the habitat necessary to sustain a wildlife population at critical periods of its life cycle. This is often a limiting factor on the population, such as breeding habitat, winter habitat, etcetera.

CULTURAL RESOURCES — A term that includes items of historical, archeological or architectural significance which are fragile, limited and non-renewable portions of the human environment.

CULTURAL SITE — Any location that includes prehistoric and/or historic evidence of human use.

DECERTIFY — To withdraw certification.

DETACHMENT — See stream detachment.

DISCOUNTED VALUE — The cash value in today's dollars of a series of future payments over a long period of time; e.g., a homeowner's mortgage of $50,000 at 12 percent interest for 30 years would generate the lender $185,151.60 in payments. The discounted value of these payments would be $50,000.

DISPOSAL ZONE — An area defined by the BLM's Land Pattern Review and Land Adjustment Plan where BLM

would attempt to dispose of its many small scattered public land parcels by exchange. Also within this area BLM would not normally acquire lands.

DRAINAGE (INTERNAL SOIL) — The property of a solid that permits the downward flow of excess water. Drainage is reflected in the number of times and in the length of time water stays in the soil.

ENDANGERED SPECIES — Determined for plants and animals by one or a combination of the following factors:

1. The present threatened destruction, modification or curtailment of a species habitat or range.

2. Over-utilization of a species for commercial sporting, scientific or educational purposes.

3. Disease or predation of the species.

4. The inadequacy of existing regulatory mechanisms.

5. Other natural or human caused factors affecting a species' continued existence.

ENVIRONMENTAL ASSESSMENT — A concise public document for which a Federal agency is responsible that serves to:

1. Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

2. Aid an agency's compliance with the National Environmental Protection Act when no environmental impact statement is necessary.

3. Facilitate preparation of a statement when one is necessary. Shall include brief discussions of the need for the proposal, of alternatives as required by Section 102(2)(e) of the National Environmental Protection Act, of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted.

ENVIRONMENTAL ASSESSMENT/LAND REPORT — A document usually prepared by BLM's Realty Specialists containing the required elements of both an Environmental Assessment and Land Report.

ENVIRONMENTAL IMPACT STATEMENT (EIS) — A detailed written statement as required by Section 102(2)(C) of the National Environmental Protection Act analyzing the impacts to the environment of a proposed major undertaking (e.g., a grazing program).

EPHEMERAL STREAM — A stream that flows only after rain or during snowmelt.

EROSION — The wearing away of the land surface by running water, wind, ice or other geological agents.

EXCHANGE — A simultaneous process where by BLM conveys property it administers from the United States to a second party for property belonging to the second party which is conveyed, at the same time, to the United States.

FACULTATIVE LAGOON SYSTEM — A waste water treatment system which has both aerobic (aerated) and anaerobic (non-aerated) treatment capabilities.

FELSIC — A term applied to igneous rock having abundant light-colored minerals.

FLAT-LIMBED SYNCLINE — A syncline with the area of the fold being nearly level.

F.O.B. — Free on board: without charge to the buyer for placing goods on board a carrier at the point of shipment.

GEOMORPHIC — Pertaining to the form of the earth or its surface features.

GROUND COVER — Vegetation, mulch, litter, rock, etcetera.

GROUNDWATER — Water contained in pore spaces of consolidated and unconsolidated surface material.

HABITAT — A specific set of physical conditions that surround a species, group of species, or a large community. In wildlife management, the major constituents of habitat are considered to be food, water, cover and living space.

HEAD — The elevation to which water rises at a given point as a result of reservoir pressure.

HETEROGENEITY — The quality or state of being heterogeneous; composition from dissimilar parts.

HUNTER DAY — One person hunting during any part of one day.

HYDROLOGY — The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground and underground.

IMPACTS — An influence or effect on something.

INFILTRATION — The penetration of water into the soil surface through pores of the soil. The rate and amount of infiltration is limited by the size and abundance of pores, organic matter content and the water absorption capacity of the soil.

INTERMITTENT STREAM — A stream which flows most of the time but occasionally is dry or reduced to pool stage.

KINEMATICS — The branch of mechanics that deals with pure motion, without reference to the masses of forces involved.

LAND REPORT — A written document detailing and substantiating the environmental impacts and decisions on a proposed land or right-of-way action. It fulfills the environmental analysis and decision document requirements of Title 40 CFR 1500-1508.

LAND TENURE (PATTERN) ADJUSTMENT — The BLM plan to rearrange its land ownership pattern by disposing of small scattered tracts of unmanageable public lands and blocking up (acquire) lands in areas where large blocks of public lands already exist.

LEASABLE MINERALS — Minerals subject to lease by the Federal Government including oil, gas and coal.

LEK — An assembly area where birds, especially grouse, carry on display and courtship behavior.

LEGUME — The fruit or seed of leguminous plants, i.e., peas or beans; any of a large family of dicotyledonous herbs, shrubs or trees having leguminous fruits bearing nodules on the

roots that contain nitrogen-fixing bacteria; Native legume — one that is indigenous to the local area.

LIGNITE — A brownish-black coal, intermediate in rank between peat and sub-bituminous coal with a calorific value less than 8300 BTU/lb.

LOCATABLE MINERALS — Generally the metallic (hard rock) minerals, e.g. gold and silver, subject to development specified in the Federal Mining Law of 1872; includes bentonite, gypsum, uranium minerals.

LONGWALL MINING — A method of mining in which the faces are advanced from the shaft toward the boundary, and the roof is allowed to cave in behind the miners as work progresses.

MAFIC — A term applied to igneous rock having primarily dark ferromagnesium minerals.

MANAGEMENT FRAMEWORK PLAN (MFP) — A planning decision document that establishes for a given area, land use allocations, coordination guidelines for multiple use or protection. It is a BLM land use plan. An MFP is prepared in three steps: (1) resource recommendations, (2) impact analysis and alternative development and (3) decision making.

MESIC — Pertaining to or adapted to an environment having a moderate amount or a balanced supply of moisture.

METASEDIMENT — A sediment or sedimentary rock that shows evidence of having been subjected to metamorphosis.

MHO — A unit of electrical conductance; the reciprocal of an ohm.

MINERAL ENTRY — The location of mining claims by an individual to protect his right to a valuable mineral.

MITIGATION MEASURES — Methods or procedures for reducing or lessening the impacts of an action.

MONOCULTURE — The cultivation of a single product to the exclusion of other land uses.

MULTIPLE USE — Balanced management of the various surface and subsurface resources, without permanent impairment of the productivity of the land, that will best meet present and future needs.

OFF-ROAD VEHICLE (ORV) — Any motorized track or wheeled vehicle designed for cross-country travel over any type of natural terrain.

PERCHED AQUIFERS — An aquifer containing unconfined groundwater separated from an underlying main body of groundwater by an unsaturated zone.

PERENNIAL STREAM — A stream which flows nine or more months out of a year.

PLUTON — An igneous rock intrusion formed at great depth.

PM-10 PARTICULATES — Particulate matter suspended in the air measuring 10 microns or smaller.

PORCELLANITE — A dense siliceous rock having the texture, dull luster and general appearance of unglazed porcelain. It is less hard, dense and vitreous than chert. The term, used here, refers to a baked clay or shale found in the roof or floor of burned-out coal seams. Widely used by prehistoric peoples for manufacturing tools.

POTENTIOMETRIC HEAD (SURFACE) — An imaginary surface representing the total head of ground water and defined by the level to which water will rise in a well. The water table is a particular potentiometric surface.

PREFERENCE RIGHT LEASE — A noncompetitive coal lease granted to an applicant that has demonstrated the discovery of commercial quantities of coal within their prospecting permit area.

PRODUCTIVE FOREST LAND — Forest land that is capable of yielding at least 20 cubic feet of wood per acre per year of any tree species.

PUBLIC-BODY AND SMALL BUSINESS SET-ASIDE LEASING — A special type of lease, reserved by the Secretary of the Interior, open only to a restricted class of bidders. The Secretary can reserve a reasonable number of lease tracts for special leasing opportunities for small businesses or publicly-owned and non-profit organizations and corporations.

PUBLIC LANDS — Any land and interest in land (outside of Alaska) owned by the United States and administered by the Secretary of the Interior through the Bureau of Land Management.

PUBLIC PARTICIPATION — Part of BLM's planning system that provides the opportunity for citizens as individuals or groups to express local, regional and national perspectives and concerns in the rule making, decision making, inventory and planning processes for public lands. This includes public meetings, hearings or advisory boards or panels that may review resource management proposals and offer suggestions or criticisms for the various alternatives considered.

RAPTOR — Bird of prey with sharp talons and strongly curved beaks, e.g., hawks, owls, vultures, eagles.

RECORD OF DECISION — A separate and concise public record which links the decision maker's or manager's decision to the analysis presented in the EIS and shows how environmental impacts and other factors were considered in the decision making process.

RECREATIONAL OPPORTUNITY — Those outdoor recreation activities which offer satisfaction in a particular physical, social and management setting in the EIS areas, these activities are primarily hunting, fishing, wildlife viewing, photography, boating and camping.

RESOURCE MANAGEMENT PLAN (RMP) — A land use plan, as described by the Federal Land Policy and Management Act, which establishes in a written document a step-by-step process for considering multiple resource values, resolving conflicts and making resource management decisions. Approval of an RMP is considered a major Federal action significantly affecting the quality of the human environment, necessitating the development of an EIS.

RETENTION ZONES — Areas where BLM intends primarily to retain or enhance its existing public land holdings.

RIPARIAN AREA — A specialized form of wetland with characteristic vegetation restricted to areas along, adjacent to or contiguous with rivers and streams, also, periodically, flooded lake and reservoir shore areas, as well as lakes with stable water levels.

RIVER MANAGEMENT PLAN — A developed plan specifying management actions along or within a river corridor.

ROOM AND PILLAR TYPE UNDERGROUND MINING — A mining method in which a portion (generally 50 percent) of the coal is left in place to support mine roof after the excavation of the other portion of the coal. The coal left in place resembles large supporting pillars.

ROYALTY — Compensation or portions of the proceeds paid to the owner of a right for the use of it.

SALEABLE MINERALS — High volume, low value mineral resources including common varieties of rock, clay, decorative stone, sand and gravel.

SALINITY — A measure of the mineral substances dissolved in water.

SANDY — A soil containing a large amount of sand. Textural classes are sands and loamy sands.

SCENIC QUALITY — The degree of harmony, contrast and variety within a landscape.

SCOPING — A process by which an agency responsible for developing an EIS conducts public meetings to consider the range of actions, alternatives and impacts to be considered in an EIS.

SCORIA (CLINKER) — Baked and fused rock resulting from the in-place burning of coal deposits.

SEDIMENT — Soil, rock particles and organic or other debris carried from one place to another by wind, water and gravity.

SEDIMENTATION — The action or process of deposition of material borne by water, wind or glacier.

SERAL STAGE — One of a series of ecological communities that succeed one another in the biotic development of an area.

SHRUB — A low, woody plant, usually with several stems, that may provide food and/or cover for animals.

SIGNIFICANT IMPACTS — Significant impacts are defined by their context and intensity. Generally, impacts are identified in the context of the project area, and the extent these impacts are perceptible beyond the project area. Intensity relates to the degree of the affect on public health, safety and unique characteristics of the area, and the degree of controversy or risk. Impacts may be insignificant individually but significant when added together. An impact which violates a law imposed for the protection of the environment is generally significant.

SUB-BITUMINOUS COAL — A black coal, intermediate by rank between lignite and bituminous coal; distinguished from lignite by higher carbon and lower moisture content; further classified by its calorific value.

SURFACE OWNER CONSENT — On split estate lands where the surface is owned by a qualified surface owner, coal deposits that will be mined by other than underground mining techniques shall not be included in a lease sale without evidence of written consent from the qualified surface owner allowing entry and commencement of surface mining operations.

SWALE — A small depression.

SYNCLINE — A trough shaped or concave upward fold in the underlying geologic structure.

TESTBURN — Excavation of a given amount of coal from a test pit for determining the marketability of the coal for prospective customers.

THREATENED SPECIES — A species that the Secretary of the Interior has determined to be likely to become endangered within the foreseeable future throughout all or most of its range.

TOPOGRAPHY — The exact physical features and configuration of a place or region; the detailed and accurate description of the landforms of a place or region.

TOTAL DISSOLVED SOLIDS — The dry weight of dissolved material, organic and inorganic, contained in water.

TRANSMISSITIVITY — The ratio at which water of the prevailing kinematic viscosity is transmitted through a unit width of an aquifer under a unit hydraulic gradient.

TURBIDITY — An interference to the passage of light through water due to insoluble particles of soil, organics, microorganisms and other materials.

UNSUITABILITY CRITERIA — A list of criterium, published in the Code of Federal Regulations, regarding the unsuitability of Federal lands for all or certain stipulated methods of coal mining.

VISCOSITY — The property of a substance to offer internal resistance to flow; its internal friction.

VISUAL RESOURCES — The land, vegetation and animals that comprise the scenery of an area.

VISUAL RESOURCE MANAGEMENT CLASSES — The degree of acceptable visual change within a characteristic landscape. A class is based upon the physical and sociological characteristics of any given homogeneous area and serves as a management objective.

CLASS I areas (preservation) provide for natural ecological changes only. This class includes primitive areas, some natural areas, some wild and scenic rivers and other similar sites where landscape modification activities should be restricted.

CLASS II (retention of the landscape character) includes areas where changes in any of the basic elements (form, line, color or texture) caused by management activity may be evident in the characteristic landscape.

CLASS III (partial retention of the landscape character) includes areas where changes in the basic elements (form, line, color or texture) caused by management activity may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing character.

CLASS IV (modification of the landscape character) includes areas where changes may subordinate the original composition and character; however, they should reflect what could be a natural occurrence within the characteristic landscape.

CLASS V (rehabilitation or enhancement of the landscape character) includes areas where change is needed. This class applies to areas where the landscape character has been so disturbed that rehabilitation is needed. This class would apply to areas where the quality class has been reduced because of unacceptable intrusions. It should be considered an interim short-term classification until one of the other classes can be reached through rehabilitation or enhancement.

VOLATILITY (VOLATILE MATTER) — In coal, those substances, other than moisture, that are given off as gas and vapor during combustion.

WATER QUALITY — The chemical, physical and biological characteristics of water with respect to its suitability for a particular use.

WATERSHED — All lands which are enclosed by a continuous hydrologic drainage divide and lie upslope from a specified point on a stream.

WATERSHED COVER — The material (vegetation, litter, rock) covering the soil and providing protection from, or resistance to, the impact of raindrops and the energy of overland flow, and expressed in percent of the area covered.

WELL-BEING — Condition of human happiness and health, measured objectively by socioeconomic indicators or subjectively with individual perceptions.

WETLANDS — Permanently wet or intermittently flooded areas where the water table (fresh, saline or brackish) is at, near or above the soil surface for extended intervals, where hydric wet soil conditions are normally exhibited and where water depths generally do not exceed two meters.

WILDERNESS — An area formally designated by Congress as a part of the National Wilderness Preservation System.

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PLANT AND ANIMAL SCIENTIFIC NAMES

Plants

Grasses

Alkali sacaton	*Sporobolus airoides*
Basin wildrye	*Elymus cinereus*
Big bluestem	*Andropyron spicatum*
Bluebunch wheatgrass	*Agropyron spicatum*
Blue grama	*Bouteloua gracilis*
Bluegrass	*Poa spp.*
Bottlebrush squirreltail	*Sitanion hystrix*
Green needlegrass	*Stipa viridula*
Idaho fescue	*Festuca idahoensis*
Inland saltgrass	*Distichlis stricta*
Kentucky bluegrass	*Poa pratensis*
Little bluestem	*Andropogan scoparius*
Needle and thread	*Stipa comata*
Pinegrass	*Calamagrostis rubescens*
Plains reedgrass	*Calamagrostis montanensis*
Prairie junegrass	*Koeleria cristata*
Prairie sandreed	*Calamovilfa langifolia*
Redtop	*Agrostis alba*
Richardson needlegrass	*Stipa richardsoni*
Rough fescue	*Festuca scabrella*
Sandberg bluegrass	*Poa secunda*
Slender wheatgrass	*Agropyron trachycaulum*
Sideoats grama	*Bouteloua curtipendula*
Thickspike wheatgrass	*Agropyron dasystachyum*
Timothy	*Phleum pratense*
Western wheatgrass	*Agropyron smithii*

Grasslike Plants

Rushes	*Juncus spp.*
Sedges	*Carex spp.*
Threadleaf sedge	*Carex filifulai*

Forbs

Canada thistle	*Cirsium arvense*
Clover	*Trifolium spp.*
Fringed sagewort	*Artemisia frigida*
Lupine	*Lupinus humicola*
Milkvetch	*Astragalus spp.*
Phlox	*Phlox spp.*
Prairie coneflower	*Ratibida Columnifera*
Scurfpea	*Psoralea spp.*
Shoshonea	*Shoshonea pulvinata*
Spotted knapweed	*Centaurea maculosa*
Umbrella plant (Wild Buckwheat)	*Eriogonum spp.*
Vetches	*Vicia spp.*
Wild strawberry	*Fragaria spp.*

Shrubs

Bebb willow	*Salix bebbiana*
Big sagebrush	*Artemisia tridentata*
Black sagebrush	*Artemisia arbusoula nova*
Bud sagebrush	*Artemisia spinescens*
Common chokecherry	*Prunus virginiana*
Dwarf huckleberry	*Vaccinium caespitosum*
Firmleaf willow	*Salix boothii*
Greasewood	*Sarcobatus vermiculatus*
Grouse whortleberry	*Vaccinium scoparium*
Kinnikinnick	*Aretostaphylos uva-ursi*
Nuttall saltbush	*Atriplex nuttallii*
Shadscale saltbush	*Atriplex confertifolia*
Shrubby cinquefoil	*Potentilla fruiticosa*
Silver sagebrush	*Artemisia cana*
Skunkbush sumac	*Rhus trilobata*
Slinder willow	*Salix exigua*
Sumac	*Rhus spp.*
Twinflower	*Linnaea borealis*
Water birch	*Batula occidentalis*
Western snowberry	*Symphoricarpos occidentalis*
Willows	*Salix spp.*
Winterfat	*Eurotia lantata*

Trees

Aspen (Quaking)	*Populus tremuloides*
Cottonwood	*Populus spp.*
Douglas fir-Pseudotsuga menziesii glauca	
Green ash	*Fraxinus pennsylvanica*
Junipers	*Juniperus spp.*
Lodgepole pine	*Pinus contorta latifolia*
Ponderosa pine	*Pinus ponderosa*
Rocky mountain juniper	*Juniperus scopulorum*
Subalpine fir	*Abies lasiocarpa*

Animals

Mammals

Antelope (Pronghorn)	*Antilocarpa americana*
Black bear	*Ursus americanus*
Black-footed ferret	*Mustela nigripes*
Elk	*Cerrus canadensis*
Lynx (Canada lynx)[1] [2]	*Lynx canadensis*
Moose	*Alces alces*
Mule deer	*Odocoileus hemionus*
White-tailed deer	*Odocoileus virginianus*
Wolverine[1] [2]	*Gulo luscus*

Birds

Bald eagle[1] [2]	*Haliaetus leucocephalus*
Blue grouse	*Dendragupus obscurus*
Brewer's Sparrow[2]	*Spizella pusilla*
Canada goose (giant)	*Branta canadensis*
Cinnamon teal	*Anas cyanoptera*
Coopers hawk[2]	*Accipiter cooperil*

Ferruginous hawk[1 2]	*Buteo regalis*
Flickers (common)	*Colaptes auratus*
Franklin grouse (spruce goose)	*Dendragapus canadensis*
Gadwall	*Anas strepera*
Golden eagle[2]	*Aquila chrysaetos*
Great grey owl[2]	*Strix nebulosa*
Hawks	*Accipitridae*
Kestrel (American)	*Falco sparverius*
Long-billed curlew[1 2]	*Numenius americanus*
Merlin[2]	*Falco columbarius*
Mountain plover[1 2]	*Charadrius montanus*
Northern goshawk[2]	*Accipiter gentilis*
Northern harrier	*Circus cyaneus*
Northern pygmy owl[2]	*Glaucidium gnoma*
Olive-sided flycatcher[2]	*Contopus borealis*
Owls	*Strigidae*
Osprey[2]	*Pondion naliaetus*
Peregrine falcon	*Falco peregrinus*
Pheasant (ring-necked)	*Phasianus colchicus*
Prairie falcon[1 2]	*Falco mexicanus*
Red-tailed hawk	*Buteo jamaicensis*
Rough-legged hawk	*Buteo lagopus*
Ruffed grouse	*Bonasa umbellus*
Sage grouse	*Centrocercus urophasianus*
Sharp-shinned hawk	*Accipiter striatus*
Sharp-tailed grouse	*Tympanachus phasianellus*
Swainson's hawk[1 2]	*Buteo swainsoni*
Widgeon	*Anas americanus*
Wild turkey	*Meleagris gallopavo*
Woodpeckers	*Picidae*

Fish

Artic grayling[1 2]	*Thymallus arcticus*
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Mountain whitefish	*Prosopium williamsoni*
Rainbow trout	*Salmo gairdneri*

[1]Federal sensitive species (includes threatened and endangered species).
[2]State species of special concern.

ABBREVIATIONS AND ACRONYMS

ACEC	Areas of Critical Environmental Concern
ACT	Assessment Court Treatment
AFDC	Aid to Families With Dependent Children
AIRFA	American Indian Religious Freedon Act
ANB	Average Number Belonging
AUM	Animal Units Per Month
BEA	United States Bureau of Economic Analysis
BLM	Bureau of Land Management
BSR	Birth Survival Rate
BTU	British Thermal Unit
CEQ	Council on Environmental Quality
CFM	Cubic Feet Per Minute
DHES	Department of Health and Environmental Sciences
DSL	Department of State Lands
DUI	Driving Under the Influence (of Alcohol)
EIS	Environmental Impact Statement
EMT	Emergency Medical Technician
F	Fahrenheit
FAP	Federal Aid Primary System (refers to Highway Funding)
F.O.B.	Free On Board
FY	Fiscal Year
GNP	Gross National Product
gpm	gallons per minute
GVM	Gross Vehicle Weight
HUD	United States Department of Housing and Urban Development
KRCRA	Known Recoverable Coal Resource Area
LBA	Lease By Application
LOS	Level Of Service
MBMG	Montana Bureau of Mines and Geology
MDFW&P	Montana Department of Fish, Wildlife and Parks
MDHES	Montana Department of Health and Environmental Sciences
MDOH	Montana Department of Highways
MDSL	Montana Department of State Lands
MERDI	Montana Energy and MHD Research and Development Institute
Meridian	Meridian Minerals Company
MFP	Management Framework Plan
MHD	Magneto-Hydro-Dynamics
MLS	Multiple Listing Service
MSA	Metropolitan Statistical Area
MTI	Montana Teen Institute on Substance Abuse

NEPA	National Environmental Policy Act
NIPA	National Income and Product Accounts
NPA	National Planning Association
NPRC	Northern Plains Resource Council
NRET	Northwest Regional Evaluation Team
ORV	Off-Road Vehicle
OSM	Office of Surface Mining
PILT	Payment-In-Lieu of Taxes
PM-10	10 Micron Particulate Matter
PNF	Private Non-Farm
POWER	Protective Organization for Water and Environmental Resources
PRDAS	Powder River Data Adequacy Standards
RCT	Regional Coal Team
REPS	Regional Economic Projections Series
RMP	Resource Management Plan
ROD	Record of Decision
ROM	Run of Mine
ROS	Recreation Opportunity Spectrum
RR	Retention Rate
RV	Recreational Vehicle
SE	School Enrollment
SIC	Standard Industrial Classification
SMCRA	Surface Mining Control and Reclamation Act
SYB	School Year Births
TIP	Teens In Partnership
TPY	Tons Per Year
TSP	Total Suspended Particulate Matter
USGS	United States Geological Survey
VA	Veterans Administration
VRM	Visual Resource Management
YCC	Yellowstone Coal Company

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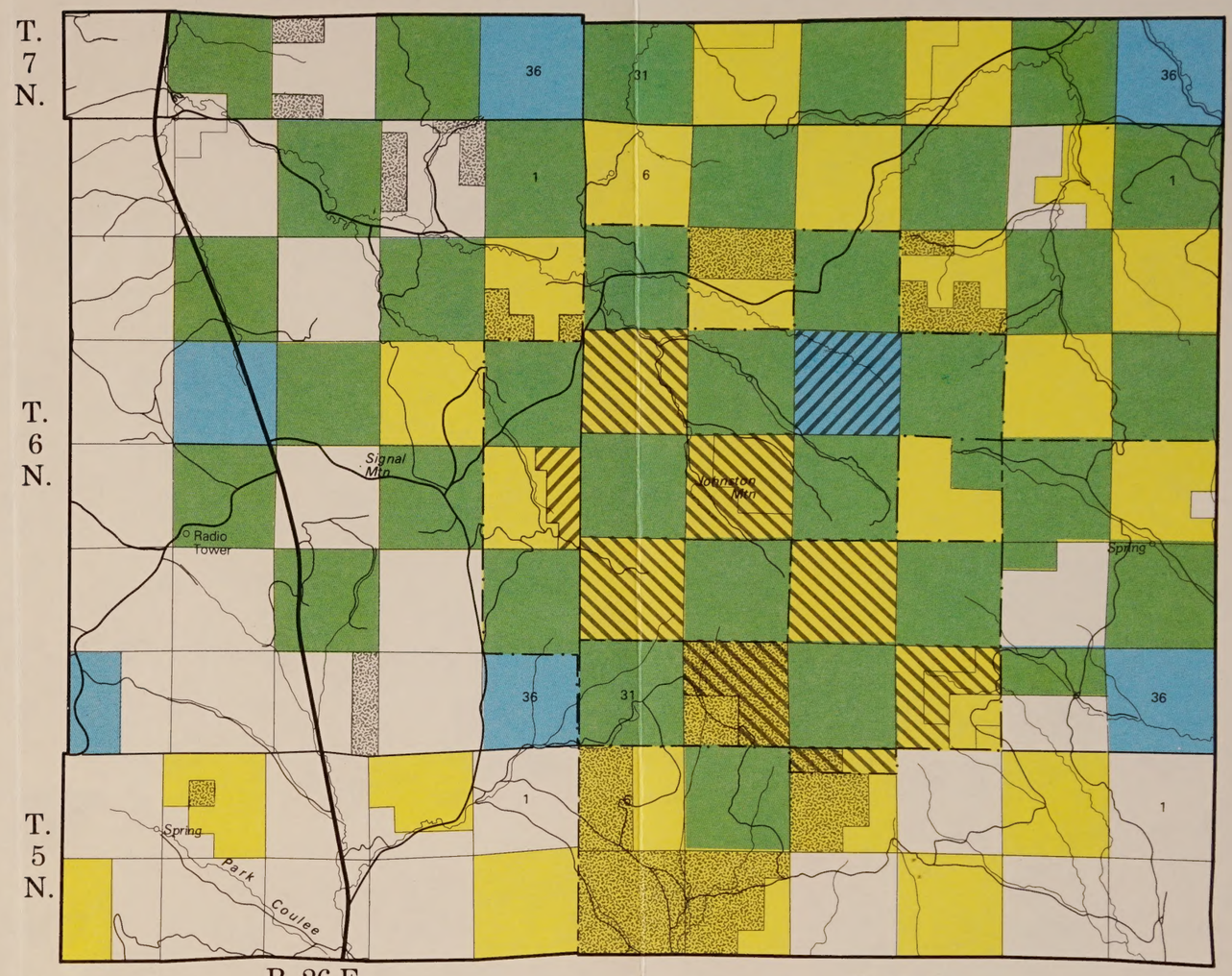
Bull Mountains Coal Lands



Project Area

Federal Coal Ownership

Federal Coal Requested for Exchange

State Coal Ownership

Additional Lands Considered for Leasing

Meridian Minerals Coal Ownership

Bureau of Land Management Surface Ownership

0 1 2 3 4 Miles

0 1 2 3 4 5 Kilometers

Scale
1:100,000

N

Map 1

R. 2 W. R. 1 W. R. 1 E.

T. 6 S.

T. 7 S.

T. 8 S.

T. 9 S.

Priority #1 Lands

Priority #2 Lands

Priority #3 Lands

Bull Mountains Coal Exchange
Priority Lands #1,2,3

LEGEND

- Bureau of Land Management Surface Ownership
- National Forest
- State Lands
- Offered Private Lands
- Private

Scale

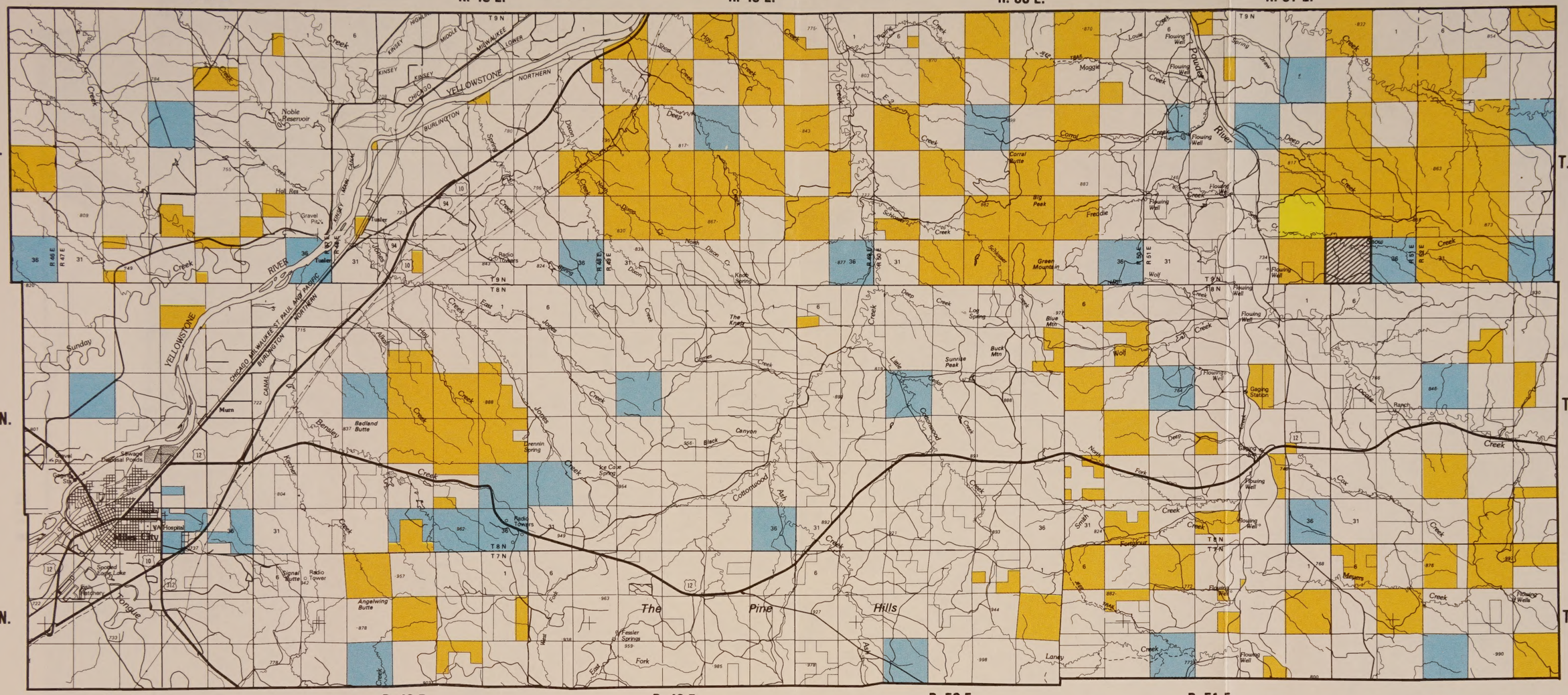
Map 2

R. 47 E. R. 48 E. R. 49 E. R. 50 E. R. 51 E.

T. 9 N.

T. 8 N.

T. 7 N.



R. 47 E. R. 48 E. R. 49 E. R. 50 E. R. 51 E.

LEGEND

- Bureau of Land Management Surface Ownership
- Private
- State Lands
- Offered Private Lands

N

KILOMETERS 1 0 1 2 3 4 5 6 7

MILES 1 0 1 2 3 4 5

Scale

Bull Mountains Coal Exchange
Priority Lands #4

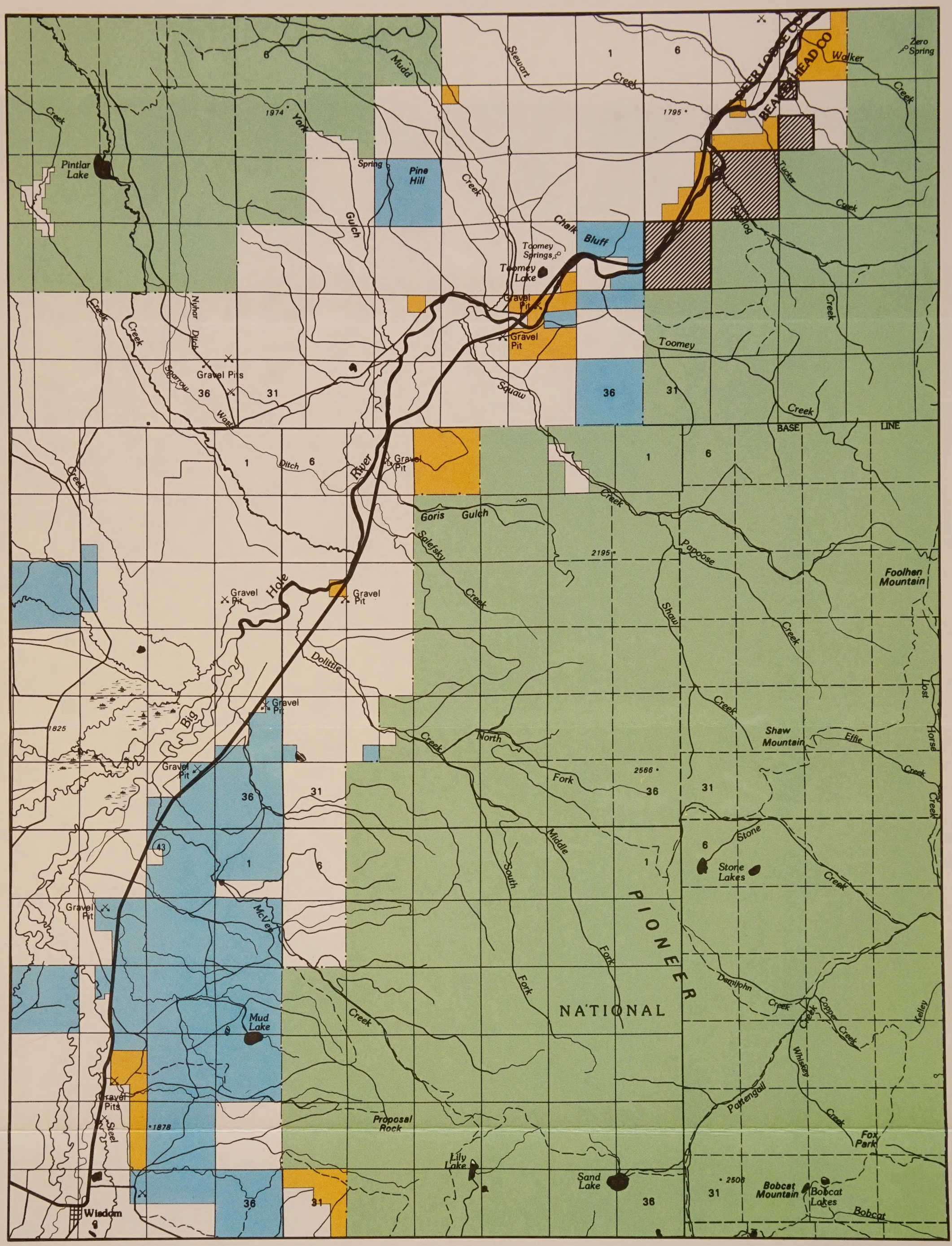
Map 3

R. 15 W. R. 14 W. R. 13 W.

T. 1 N.

T. 1 S.

T. 2 S.



R. 15 W. R. 14 W. R. 13 W.

LEGEND

- Bureau of Land Management Surface Ownership
- National Forest
- State Lands
- Offered Private Lands
- Private

-N-

Bull Mountains Coal Exchange Priority Lands #5

0 1 2 3 Miles
0 1 2 3 4 5 Kilometers
Scale

Map 4

R. 20 E. R. 21 E. R. 22 E.

T. 7 S.

T. 8 S.

T. 9 S.

Red Lodge
Washoe
Bearcreek
Brophy Mine
Towne Point
Piney Dell
Mount Maurice
Bidstrip Res
Airport
Powerline
Haara Ditch
McDonald Creek
Knowlton Ditch
Rosetta Ditch
Scotch Coulee
Virtue Gulch
Bear Creek
Foster Gulch
Snake Gulch
Ruler Bench
Wolf Gulch
Tiger Gulch
Dilworth Bench
Haywood Gulch
Howell Creek
Maurice Creek
Sheridan Creek
Seeley Creek
South Fork Spring Creek
North Fork Spring Creek
Tolman Flat
Gold Creek
Ruby Creek
Mill Creek
North Robinson Creek
Line Creek
Draw
Dilworth Creek
Grove Creek
Clarks Fork Bear
Wills Creek
Shupak Fork
Jeep Trail
Larkin Coulee
Chance
MONTANA
WYOMING
CARBON CO
PARK CO
T 58 N

R. 103 W. R. 102 W. R. 22 E.

LEGEND

- Bureau of Land Management Surface Ownership
- National Forest
- State Lands
- Offered Private Lands
- Private

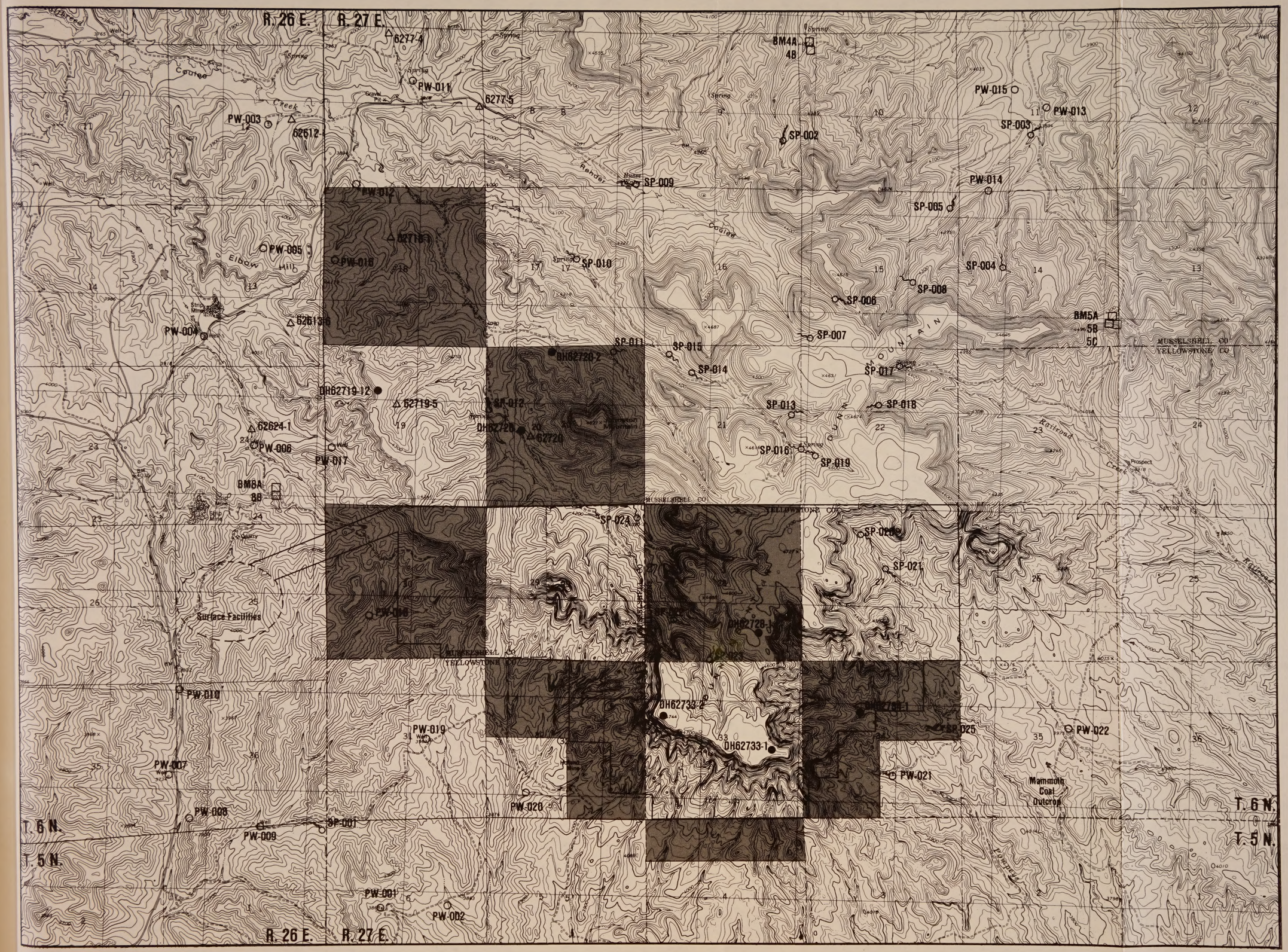
N

Bull Mountains Coal Exchange
Priority Lands #6

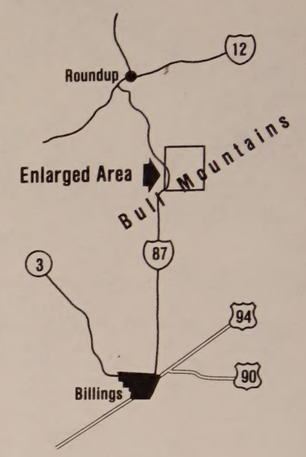
0 1 2 3 Miles
0 1 2 3 4 5 Kilometers

Scale

Map 5



LOCATION MAP



- Private Wells
- LL&E Observation Wells
- MBMG Observation Wells
- Meridian Test Holes
- Springs

N

0 2000
Feet

Bull Mountains Coal Exchange

WELL AND SPRING LOCATIONS

MAP 6

Source: Northern Engineering and Testing, 1988.

R. 26 E. R. 27 E.

3720
3740
3760
3780
3800
3820
3840
3860
3880
4000
4020

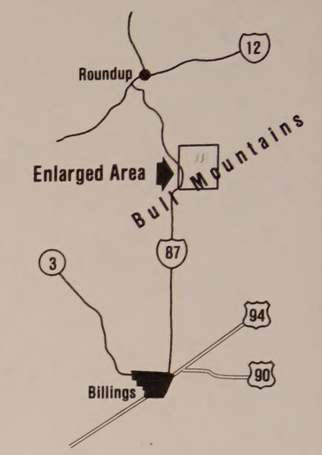
Surface Facilities

Mammoth Coal Outcrop

T. 6 N.
T. 5 N.

R. 26 E. R. 27 E.

LOCATION MAP



N

0 2000
Feet

Bull Mountains Coal Exchange

STRUCTURE CONTOURS TOP OF MAMMOTH COAL

(Modified from Connor and Griffith, U.S.G.S. Open File Rept. 80-711)

MAP 7

Source: Northern Engineering and Testing, 1988.

R. 26 E. R. 27 E.

T. 6 N.
T. 5 N.

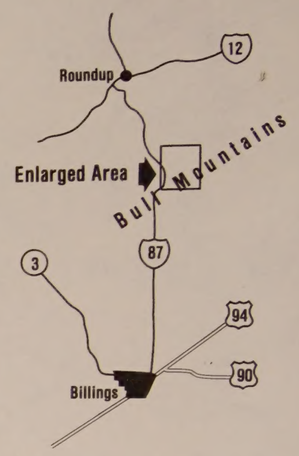
Surface Facilities

Mammoth Coal Outcrop

MUSSELSHELL CO
YELLOWSTONE CO

3820
3840
3860
3880
3900
3920
3940
3950

LOCATION MAP



Line of equal hydraulic head above the base of the Mammoth coal.

Potentiometric contours of the Mammoth coal.

N

0 2000
Feet

Bull Mountains Coal Exchange

HYDROGEOLOGIC DATA

(Modified from Rome, Spectrum Engineering, Billings, MT)

MAP 8

Source: Northern Engineering and Testing, 1988.

T.8N.
T.7N.
T.6N.
T.5N.
T.4N.
T.3N.
T.2N.
T.1N.

R. 23 E.
R. 24 E.
R. 25 E.
R. 26 E.
R. 27 E.

North Route
West Route

Roundup
Klein
Ferrelltown
Gibbtown
Riverside
Lavina
Broadview
Acton
Comanche
Shepherd
Billings
Molt

GOLDEN VALLEY CO
MUSSELSHELL CO
YELLOWSTONE CO
STILLWATER CO

Musselshell River
Yellowstone River
Pryor Creek
Coulee
Creek
Basin
Fork
Road
Hallbreed
Stanley
Cottonwood
Harper
Hoskin
Razor
Dunn Mountain
Johnston Mtn
Red Bluff
Rattlesnake Butte
Rattlesnake Reservoir
Five Mile
Ninemile
Alkali
Rimrocks
Twin Lakes
Gravel Pit
Airport
Landing Strip
Radio Facility
Radio Tower
Signal Bluff
Elbank Hill
Tunnel
Powerline
Pipeline
Spring
Springs
Well
Wells
Dam
Ditch
Canal
BBWA Canal
Spring Nipple
Rattlesnake Reservoir
Lake Elmo
Holling Res
Logan International Airport
Service Cliff
Gravel Pit
Bench
Billings
Shepherd
Molt
Comanche
Acton
Lavina
Broadview
Roundup
Riverside
Gibbtown
Klein
Ferrelltown

BURLINGTON NORTHERN
Powerline
Pipeline
Baseline
BASE LINE

Proposed Railroad Routes and
Truck Haul Route to Huntley

Proposed Railroad Right-of-Way Corridor

Truck Haul Route

-N-

Map 9

R. 26 E. R. 27 E.

T. 6 N.
T. 5 N.

Surface Facilities

Mammoth Coal Outcrop

MUSSELSHELL CO.
YELLOWSTONE CO.

Quinn Mountain

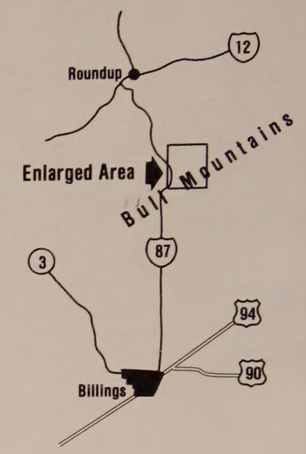
Elbow Creek

Rehder Draw

Prospect Creek

Railroad

LOCATION MAP



Depth contour, thickness of Mammoth overburden.

Zero static water level, base of Mammoth coal.

N

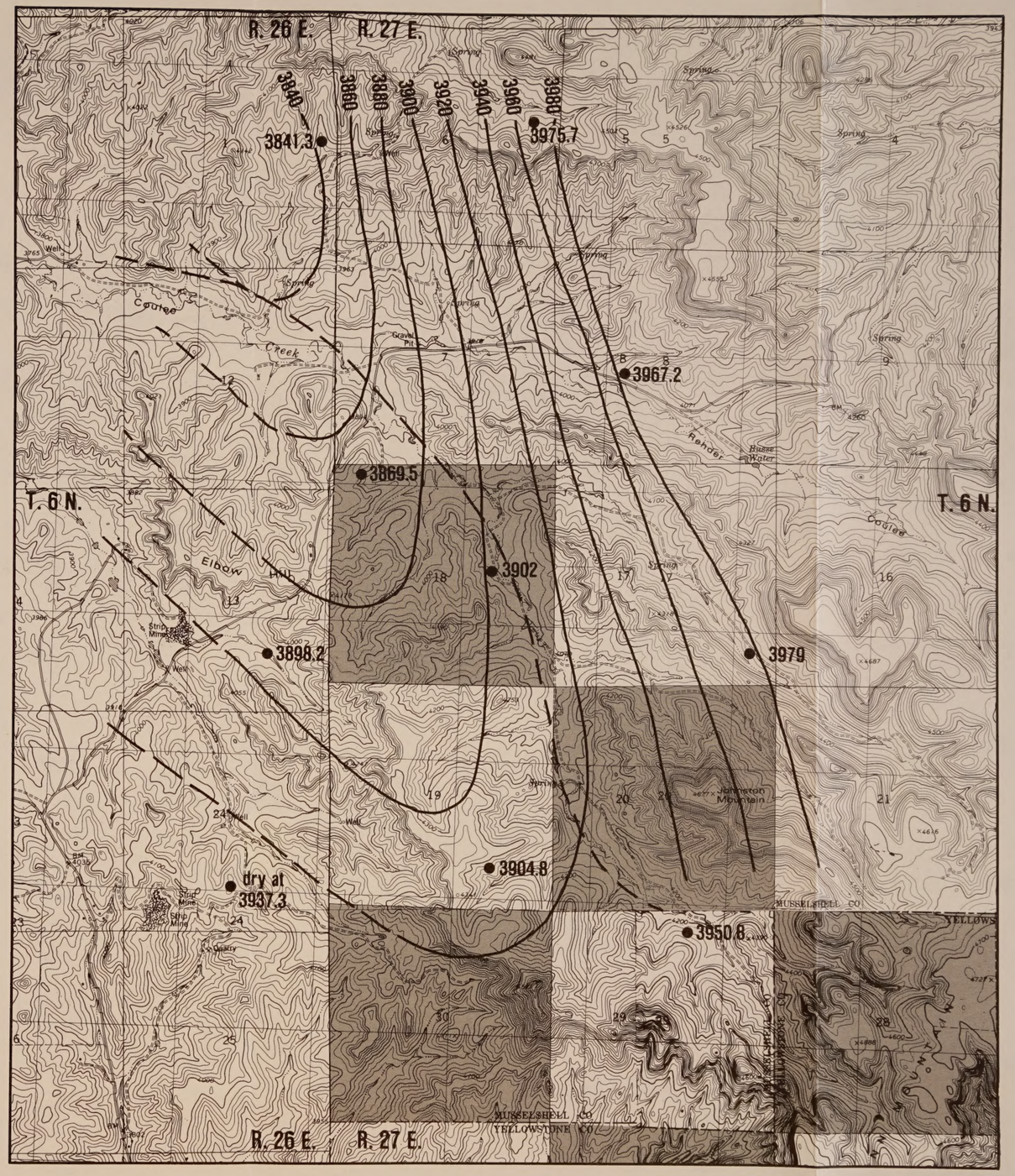
0 2000
Feet

Bull Mountains Coal Exchange

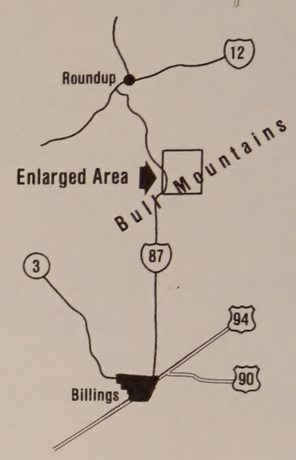
DEPTHS TO MAMMOTH COAL

MAP 10

Source: Northern Engineering and Testing, 1988.



LOCATION MAP



- Approximate Hydrologic Boundary
- Potentiometric Contours
- ● Static water level elevation in overburden wells.

N

0 2000
Feet

Bull Mountains Coal Exchange

POTENTIOMETRIC SURFACE MAMMOTH OVERBURDEN

MAP 11

Source: Northern Engineering and Testing, 1988.

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WESTERN FIELD OPERATIONS
DENVER, CO. 80202

GOVERNMENT LIBRARY (OSMRE)
WESTERN FIELD OPERATIONS
DENVER, CO. 80202

DATE DUE		

TD
195
.C58
U65

U.S. Bureau of land management
Bull mountains exchange: draft eis.

Office of Surface Mining
Brooks Towers
1020-15th Street
Denver, Colo. 80202

Offered Private Lands
Priority Lands #5

Bull Mountains Coal Lands

Economic Study Area

Peabody Coal Tracts

Offered Private Lands
Priority Lands #4

Offered Private Lands
Priority Lands #1, 2, 3

Offered Private Lands
Priority Lands #6

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MONTANA STATE OFFICE
BILLINGS, MONTANA

LAND STATUS

STATE OF MONTANA

1984

LEGEND

- State Office
- District Office
- Resource Area Office
- Boundaries of B. L. M. District
- Established Wilderness Area Boundaries
- Public Lands (As of May 1984)
- Acquired Lands (Bankhead-Jones Act)
- Indian reservations
- National Forests
- National Parks, Monuments
- National Wildlife Refuge
- Military Reservation and Corps of Engineers
- State Lands
- State Recreation Areas and Wildlife Areas, containing 1,500 acres or more
- Private Lands
- Township and Range Locator

Land Status Compiled by Bureau of Land Management

Scale 1:1,000,000

Lambert conformal conic projection based on standard parallels 33° and 45°

Contour interval 500 feet
Datum is mean sea level

Base map prepared by the U. S. Geological Survey, 1927 North American datum

SOURCE DATA:
U. S. Geological Survey 1:250,000 scale topographic maps
U. S. Geological Survey 1:100,000 scale topographic maps

FOR SALE BY BUREAU OF LAND MANAGEMENT, 2929 MINUTEMAN, BILLINGS, MONTANA 59101

NOTE TO MAP USERS

This map is a general planning and management aid, prepared from the best available information, but subject to certain limitations.

(1) The surface and mineral rights of Federal agencies are shown as patented lands (white) because of a lack of information on acquisition.

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Note: Access through private land may be restricted.

Bull Mountains Exchange

Selected Federal Coal
and
Offered Private Lands
Locator Map

GOVERNMENT LIBRARY (OSMRE)
WESTERN FIELD OPERATIONS
DENVER, CO. 80202

C A N

GLACIER NATIONAL PARK

BLACKFEET INDIAN RESERVATION

GLACIER

TOOLE

LIBERTY

HILL

PONDERA

TETON

CHOUTEAU

CASCADE

FERGUS

JUDITH BASIN

LEWIS AND CLARK

LINCOLN

SANDERS

LAKE

FLATHEAD

MINERAL

MISSOULA

POWELL

CLARK

FORK

NATIONAL FOREST

INDIAN RESERVATION

WILDERNESS

MOUNTAINS

Whitefish

Columbia Falls

KALISPELL

Cut Bank

Shelby

Conrad

Choteau

GREAT FALLS

MISSOULA

Fort Benton

Lonesome Prairie

Big Sandy

Stanford

Virginia City

Ennis

Three Forks

Bozeman

Livingston

Helena

Butte

Anaconda

Deer Lodge

Dillon

Hamilton

Darby

Philipsburg

Drummond

Seeley Lake

Polson

Ronan

Charlo

Arlee

Thompson Falls

Libby

Eureka

Whitefish

Columbia Falls

Kalispell

Bigfork

Lakeside

Creston

Somers

Proctor

Dayton

Elmo

Big Arm

Wild Horse Island

Flathead Lake

Swan Lake

Swan River State Forest

Bison Range

Moiese

Missoula

Lolo

Florence

Stevensville

Hamilton

Darby

Sula

Conner

Hot Springs

Camas Prairie

Arlee

Dixon

Ravalli

Superior

Alberton

Haugan

Heron

Noxon

Trout Creek

Paradise

Plains

Thompson Falls

Libby

Troy

Yaak

Eureka

Rexford

Fortine

Essex

Marion

Olney

Martin City

Hungry Horse

Coram

Glacier Park Int.

Apgar

West Glacier

Belton

Columbia Falls

Whitefish

Kalispell

Evergreen

Bigfork

Lakeside

Somers

Creston

Kila

Lakeside

Blacktail

A D A

BLAINE

PHILLIPS

VALLEY

DANIELS

SHERIDAN

FORT PECK INDIAN RESERVATION

ROOSEVELT

FERGUS

PETROLEUM

GARFIELD

MC CONE

RICHLAND

DAWSON

PRAIRIE

WIBAUX

NORTH DAKOTA

CHARLES M RUSSELL NATIONAL WILDLIFE REFUGE

FORT BELKNAP INDIAN RESERVATION

ROCKY BOY INDIAN RESERVATION

LEWIS AND CLARK NATIONAL FOREST

HAVRE

Glasgow

Wolf Point

Poplar

Sidney

Malta

Chinook

Harlem

Fort Belknap Agency

Fort Peck

Zortman

Landusky

Lewistown

Jordan

Circle

Glendive

Terry

Medicine Lake

Bainville

Culbertson

Froid

Scobey

Plentywood

Westby

Crane

Forsyth

Miles City

Baker

Winnett

Roy

Hilger

Gilt Edge

Ross Fork

Glengarry

Forestgrove

Moore

Judith Gap

Buffalo

Harlowton

Roundup

Musselshell

Melstone

Broadus

Ekalaka

Alzada

Camp Crook

Lodge Pole

Hays

Earlton

Leroy

Cleveland

Mt Reynolds

Shambo Springs

Rocky Boy

Box Elder

Havre

Harrison Park

Laredo

Big Sandy

Fort Belknap

Snake Butte

Wild Horse Butte

Three Buttes

Black Butte

Corrigan Mtn

Sawtooth Mtn

Williamson Butte

Murphy Butte

Mt Haystack

Mt Lonesome

Lone Cave Peak

Crystal Ridge

Sawtooth Ridge

Big Snowy Mts

Judith Mts

Little Belt Mts

Crazy Mts

Pryor Mts

Bull Mts

Big Horn Mts

Wolf Mts

Rosebud Mts

Sheep Mts

Pumpkin Creek

Timber Creek

Big Dry Creek

Fort Kipp

Fort Peck Dam

Fort Peck Lake

Rock Creek Recreation Area

Hell Creek Recreation Area

Devil's Creek Recreation Area

Big Dry Wilderness

Bowdoin National Wildlife Refuge

Lake Thibadeau National Wildlife Refuge

Creedman Coulee National Wildlife Refuge

Medicine Lake National Wildlife Refuge

Charles M Russell National Wildlife Refuge

U L Bend National Wildlife Refuge

Lake Mason National Wildlife Refuge

Snowy Mountains

Rocky Boy Indian Reservation

Fort Belknap Indian Reservation

Fort Peck Indian Reservation

Lewis and Clark National Forest

Big Dry Recreation Area

Rock Creek State Recreation Area

Medicine Lake National Wildlife Refuge

Lake Mason National Wildlife Refuge

Bowdoin National Wildlife Refuge

Creedman Coulee National Wildlife Refuge

Lake Thibadeau National Wildlife Refuge

Charles M Russell National Wildlife Refuge

U L Bend National Wildlife Refuge

Big Dry Wilderness

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Fort Peck Lake

Rock Creek Recreation Area

Hell Creek Recreation Area

Devil's Creek Recreation Area

Bowdoin National Wildlife Refuge

Lake Mason National Wildlife Refuge

Medicine Lake

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MONTANA STATE OFFICE
BILLINGS, MONTANA

LAND STATUS

STATE OF MONTANA

1984

LEGEND

- State Office
- District Office
- Resource Area Office
- Boundaries of B. L. M. District
- Established Wilderness Area Boundaries
- Public Lands (As of May 1984)
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- National Wildlife Refuge
- Military Reservation and Corps of Engineers
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- State Recreation Areas and Wildlife Areas, containing 1,500 acres or more
- Private Lands
- Township and Range Locater

Land Status Compiled by Bureau of Land Management

LEGEND

- State capital
- County seat
- City, town, or village
- Built-up area shown for towns over 5,000 population
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scheduled service airport

HIGHWAYS CORRECTED TO 1965

Scale 1:1,000 000

1 inch equals approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

Lambert conformal conic projection based on standard parallels 33° and 45°

Contour interval 500 foot
Datum is mean sea level

Base map prepared by the U. S. Geological Survey 1927 North American datum

SOURCE DATA

U. S. Dept. of the Interior—Geological Survey topographic maps
U. S. Dept. of the Army—Corps of Engineers topographic maps

FOR SALE BY BUREAU OF LAND MANAGEMENT, 222 N. 32ND STREET, BILLINGS, MONTANA 59107

Offered Private Lands
Priority Lands #5

Offered Private Lands
Priority Lands #1, 2, 3

Bull Moun

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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GRANITE
DEER LODGE
JEFFERSON
BROADWATER
SILVER BOW
BEAVERHEAD
MADISON
GALLATIN
MEAGHER
PARK
ANACONDA
BUTTE
HELENA
Dillon
Three Forks
Townsend
Radersburg
Boulder
Whitehall
Ennis
Virginia City
Varney
Cameron
Jackson
Wisdom
Wise River
Polaris
Big Hole Pass
Bannack
Grant
Lima
Monida
Lakeview
Red Rock Lakes
Centennial Valley
Centennial Mountains
Continental Divide
Gravelly Range
Madison Range
Tobacco Root Mts.
Ruby Range
Pioneer Mts.
Big Hole Mts.
Bitterroot Range
Anaconda Range
Flint Creek Range
Sapphire Mts.
Deerlodge National Forest
Beaverhead National Forest
Gallatin National Forest
Bitterroot National Forest
Helena National Forest
Lee Metcalf Wilderness
Bear Trap Canyon Wilderness Area
Absaroka-Beartooth Wilderness
Yellowstone National Park
Big Hole National Battlefield
Red Rock Lakes National Wildlife Refuge
Montana State Prison Farm
Lewis and Clark Caverns State Park
Missouri River
Yellowstone River
Stillwater
Clarks Fork Yellowstone
Big Hole River
Beaverhead River
Ruby River
Jefferson River
Madison River
Gallatin River
Boulder River
Smith River
Sun River
Dearborn River
Missouri River
Canyon Ferry
Hauser Dam
Holter Dam
Lewis and Clark National Forest
Lewis and Clarke National Forest
Mountain Division
Rocky Mountain Division
Yellowstone National Park
Continental Divide
Great Divide
Centennial Valley
Centennial Mountains
Big Sky
Bozeman
Livingston
Gardiner
Electric Peak
Sawtooth Mt.
Lee Metcalf Monument Mt.
Redbreast Peak
Cascade Mt.
Antone Peak
Patchtop Mt.
Taylor Mt.
Fan Mountain
Lincoln Mt.
Mt. Helena
Mt. Blackmore
Mt. Douglas
Mt. Wallace
Mt. Cowen
Mt. Dawson
Mt. Dewey
Mt. Ellis
Mt. Gray
Mt. Greeley
Mt. Hilgard
Mt. Jefferson
Mt. Powell
Mt. Rodney
Mt. Robinson
Mt. Tobacco Root
Mt. Wilson
Mt. Zion
Mt. Haggin
Mt. Fleecer
Mt. Humbug
Mt. Pleasant
Mt. Ramsay
Mt. Thompson
Mt. Tobin
Mt. Tuscaloosa
Mt. Wallace
Mt. Wesley
Mt. Wilson
Mt. Zion
Mt. Haggin
Mt. Fleecer
Mt. Humbug
Mt. Pleasant
Mt. Ramsay
Mt. Thompson
Mt. Tobin
Mt. Tuscaloosa
Mt. Wallace
Mt. Wesley
Mt. Wilson
Mt. Zion

tains Coal Lands

Economic Study Area

Peabody Coal Tracts

Offered Private Lands
Priority Lands #4

Offered Private Lands
Priority Lands #6

Bull Mountains Exchange

Selected Federal Coal and Offered Private Lands Locator Map

GOVERNMENT LIBRARY (OSMRE)
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DENVER, CO. 80202

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DENVER, CO. 80202